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THE

BOOK OF BEE-KEEPING.

I.—INTRODUCTION.

1. Spread of Bee-keeping.—Apiculture, or, as it is most frequently called, Bee-keeping, has made such rapid strides during the last few years, that it is scarcely credible that even so short a time ago as the commencement of this decade it was quite an exceptional thing to see a bar-frame hive in a cottager's garden. Now, owing to the exertions of a few in promoting this most useful employment, and greatly to the spread of information contained in periodicals—a few entirely devoted to bee-culture, many others giving a share of their columns to its advancement—it has spread itself over not only the British Isles, but many countries far distant, even to the Antipodes.

2. Advantages.—It is an employment that, when once commenced in real earnest, few get tired of; enthusiasts in bee-culture are the rule, not the exception. Why is this? It offers inducements that no other description of stock-keeping presents. These advantages and inducements we will endeavour to set forth in the following pages.

3. Object of this Book.—Many works have been written on the subject; a great number of these have become obsolete, as the researches of bee-masters have slowly and surely unravelled the mysteries surrounding the bee-hive, or have discovered new and more favourable methods of treating their little dependents. Some, although recognised as standard works, are quite beyond the reach of the artisan or cottager class, on account of their expense. It is, therefore, desirable that a perfectly comprehensible manual on apiculture should be brought before the public—one treating upon this subject in its most modern aspect, but, at the same time, being quite free from any techni-

calities that would confound its readers, and so defeat the objects of the work ; whilst the price would ensure its sale among those who, without a help of this description, would stumble about as one in the dark having no friendly light to guide them. We will thus, while inditing the pages of this book, endeavour to be guided by these precepts, trusting that, by so doing, we shall be fully understood, and thus be of practical utility in the furthering of this industry among those whose necessity compels them to augment their slender incomes through its most certain means, as well as those who look upon bee-keeping as a pastime only, of the most healthful description.

4. Persons Suited to Bee-keeping.—Many commence bee-keeping with the idea that it is simply to obtain a hive, stock it with bees, and then allow them to look after their own and their keeper's interests. This idea has, no doubt, arisen from the fact that before the modern system was introduced, it was the only method of bee-keeping ; but such a system is of no use with modern appliances ; better by far to keep the old straw skeps. A modern bee-keeper who wishes to obtain the greatest results, both intellectually and financially, is one who will neglect no opportunity of attending, at the time being, to the wants of his charges; procrastination must form no part of his character. It may be that just at the moment when his attendance is required, by procrastinating, that golden moment is passed, which, in such a fleeting season as ours, is never regained. Fear of his labourers must be banished from his mind; nothing is gained by being afraid of them—there is no necessity for such. If a bee means stinging, you cannot get away from it, as it moves much faster than you possibly can. One might almost try to dodge the lightning as to get away from a bee that has actually made up its mind to introduce its weapon into your skin. A careful, persevering man is bound to succeed. An observant mind is a great desideratum ; it is by noting the behaviour of the bees that a knowledge of their requirements is mostly gained. Note the movements of a queenless stock in comparison to one having a queen. Their movements outside the hive are a certain indication of their condition within. Open a hive, and if the bees are going to oppose you, an observant eye will foresee their intentions at a glance. How many times we have been asked the question, "When does the honey flow set in?" An observant bee-keeper will know at once. A certain amount of business tact will be required in finding a market for the produce, and here the careful bee-keeper will gain the ascendency; his honey will be neatly packed and graded as to quality. The careless will have theirs with propolis on the sections, honey leaking from the bottles, and a look of messiness pervading the whole — a bad market being the result.

5. Persons Unsuited to Bee-keeping. — Those who have an idea that bees require no attention; that care little for their requirements, be it food in winter, or ventilation and shade in summer—their only thought being the amount of honey they can get without any trouble to the keepers. The I'll-do-it-to-morrow bee-keeper cannot be successful. There are just a few who are physiologically debarred from being bee-keepers, but these are seldom met with. One who, when stung, feels the effects in a highly dangerous form; for such a one it is extremely injudicious to keep, or, rather, to handle, bees. There are many—and I wish to emphasise this—who start bee-keeping, and expect others to look after their stocks. The number of these is legion. To these, we advise either a little more energy, or get rid of the bees.

II.—ADVANTAGES OF BEE-KEEPING.

6. An Intellectual Pursuit.—No one can watch a hive of bees, be it an ordinary skep, a bar-frame, or an observatory hive, without gaining intellectually. Watch the bee as it brings home its load of pollen, carefully packed on its posterior legs, just at the very time it is wanted for the hungry larvæ within. Step into the garden, and see it gathering these loads; not first on this species of flower and then on that, but choosing all those belonging to one family—passing from a dandelion, right over that box tree, choking with pollen, to another dandelion adjacent; dusting itself all over, and then, poising in the air, removing the pollen grains from its body, and packing it tightly in its pollen baskets on each of its hind legs while thus on the wing, and then returning to the flower for another supply. Look into the observatory hive, and gaze on the workers, hanging in clusters while secreting the wax, and then, with busy feet and jaws, building their snow-white comb with the minute scales of wax obtained from underneath their bodies. Note the energy of those sentinel bees at the entrance to the hive, in a moment detecting a stranger with evident hostile intent—driving it away, or, perhaps, capturing and killing it; the industry with which they go and return with their stores, collecting only such a description as is wanted at that particular time, never for a moment at fault as to which to take. What an example to the onlooker! How dense must be his mind to fail to gain something intellectual from these examples!

7. An Aid to Health.—Fresh air, plenty of sunlight, healthy occupation for the mind, a moderate amount of exercise, are all conducive to our well-being. All these bee-keeping offers. The weakly are sufficiently strong to manage a few hives of bees; they require no great physical strength, but, to attend to them, we must be in the fresh air and sunlight

One feels invigorated after a few hours' work in the apiary. A plant cannot thrive without sunlight; no man can obtain thoroughly good health without it. Fresh air resuscitates our energies, and acts as a sedative upon the nervous person; our whole tone is brought to a healthy standard, which cannot be so if we occupy ourselves in close, ill-ventilated, and shaded apartments. Bee-keeping is a preventive; it is a poor man's doctor, or, rather, anti-doctor.

8. A Financial Success.—We say, without fear of contradiction, that no description of stock-keeping is such a financial success as bee-keeping. The old straw skep of our forefathers was a considerable source of income; how much more so must the modern hive be, replete with all the improvements introduced by intelligent and ingenious bee-keepers? One experiences a feeling of astonishment as quantities and quantities of golden honey or snow-white sections are removed from the hive, each ounce having a marketable value and forming a handsome total. We recently met a bee-keeper who, in one season, took 200 sections from one hive; 135 he sold at one shilling each, the remaining 65 (heather) at eighteenpence each. Although this is quite an exceptional case in England, scores and scores of modern bee-keepers take on an average 60lb. from a colony. Even at sixpence per pound this will show a fine profit on the outlay—thirty shillings per year is not to be despised, as a man engaged in his ordinary avocations can easily attend to ten colonies. In our Colonies, notably Australia, a crop of 200lb. from one colony would be looked upon as rather insignificant or below the average. The honey produce is not the only source of profit; wax finds a ready sale, and when one does get a swarm, a good price is usually obtainable for them upon the market.

9. An Assistance to the Working Man.—Perhaps a few quotations of accounts that we know have been paid working men for the produce of their bees, will not here be out of place. One we ourselves have paid on an average of £6 per year for some time past, and are not his only customers by far. Another, £8 in a lump sum. A working man we met in North Wales (Llanwrst) showed us his account book, and, after auditing it, we found him £29 to the good in one season. Another, in Northumberland (Felton), last season obtained a profit of £25. There are one or two we know, notably a plate-layer on a southern railway, who, keeping his bees on the railway bank, nets quite a handsome income from them. We met him last season taking a holiday in London, and a more intelligent man it would be impossible to meet; bee-keeping, to him, he owns, has raised him both intellectually and financially above his co-workers. A lady we are acquainted with netted £2 10s. from one hive in 1885. We think that the foregoing is a positive

proof as to the financial superiority of bees above other descriptions of stock kept by the working man.

10. An Adjunct to Farming and Gardening.—We have been amused, on several occasions, at the ideas of a few farmers, who deprecate bee-keeping as being detrimental to their crops. In what manner are they so? The answer has always been: "They take the saccharine matter from the clover, and so rob the hay of its sweetness." Let us look at this in its true light. What is the nectar in the clover flower produced for? As an attraction to the bees and other insects who, whilst collecting same, carry the pollen from the male to the female flower, or from the male to the female portions of different flowers, and so fertilise them. By this we obtain the production of seeds; a great impetus is given the plant in order to produce them; and they—the seeds—contain the chief elements necessary for the formation of flesh upon the cattle fed thereon. Without the seeds the hay would, in comparison, be of small value. Let us take the instance of hay that has been threshed for its seed: would a farmer give as much per ton for such hay? No. Would his stock fatten as well on such hay as that with the seeds in? No. Any stock-keeper would substantiate this. Without the bees the flowers would not be fertilised, and would produce no seeds. If this is so, the bees are a source of profit to the farmer, the stock-keeper, and the bee-keeper; the consumer of the meat even reaping a benefit therefrom. This is only one instance, as applied to clover; but it also applies to all descriptions of seed stuffs which are fertilised by insects. With the gardener or fruit-grower the above facts must be self-evident. Without bees, their cherry, apple, raspberry, plum, and currant orchards would be far less productive, and the market gardener would obtain less quantities of edible seeds and seed-pods. An apple-grower of our acquaintance, when asked the question, "Why do you keep so many bees?" replied, with a smile, "Why, I tried doing without them a few years ago, and it didn't answer; my crops of apples were hardly worth gathering." A widow woman in Hertfordshire, who depended, in a great measure, upon her cherry orchard for a subsistence, was obliged to obtain a fresh supply of bees after she had sold her original hives, as her orchard was not nearly so productive; this quickly righted itself after the introduction of the bees. These facts speak for themselves.

11. Honey as a Nutritious Food.—To those who can eat honey at any time—and there are but a few who cannot—it is a nourishment of the most agreeable form. It is the quintessence of food. As a mild aperient it ranks as one of the best. Its sweetening properties, as compared with sugar, are far superior in their action upon the health. We cannot do better than quote from the opinions of several eminent

analysts, as set forth in a pamphlet issued by the British Bee-keepers' Association : "All food, if not soluble in water, requires to be changed within the body before its nutritive parts can be received into the system. This change is accomplished by the process of solution, and is called digestion. Starch, which forms three-fourths of the bread we eat, is useless as food while it remains in the form of starch—undissolved. In the act of eating, saliva changes part of the starch into sugar, which, in due course, being received in solution into the blood, supplies heat and power. Honey, in its natural state, is already in condition for absorption into the system, and requires no labour to render it a heat-producing power. Hence the superiority of honey over all other kinds of sugar food." But here we must call attention to the fact that the honey must be pure, and none of the compounds—usually consisting of glucose—sold as such. Tons of this so-called honey have been sold in England, the purchasers becoming disgusted with it. It has frequently produced nausea and other ailments, which many have laid at the door of honey. Pure unadulterated honey, extracted from clean combs, or eaten in the form of "sections," will produce a healthy condition of the body, which no other food-stuff has a like proportion of power in so eminent a degree.

III.—THE HONEY BEE.

12. Object of Knowing its Natural History.—A condensed account of the bee's natural history is of much importance to the would-be bee-keeper; without this he will be like a man groping in the dark. The reason of this or that happening will be inexplicable, cause and effect will be an enigma. We will, therefore, endeavour to give sufficient information upon this subject that the veriest tyro will, after some reflection and observation, be able to enter into conversation upon bee-keeping matters with an assurance—at all times pleasant to feel—that his knowledge and observations have placed him in a position to substantiate any advice he may give or argument he may desire to support. But we should wish especially to give this caution ; that not alone from quotations from books should the knowledge be gained, but from close application to the practical study of the hive and its contents ; deducing such theories as seem probable, and comparing these with those as written here and in other works upon the subject.

13. Place in the Animal Kingdom.—The bee belongs to the branch of the animal kingdom called *Articulata*, as all its parts are jointed or articulated, and having no internal skeleton. It forms one of the class of *Insecta*, which breathe the air through a complication of tubes, branching all over the body. The openings of these tubes are called spiracles, and are situated along each side of the body ; these are fringed

with hairs, which exclude any dust or foreign particles from entering. Its sub-class is the true insects or *Hexapoda* (meaning six feet). This sub-class is characterised by their having three divisions to the body—head, thorax, and abdomen. The order of the honey-bee is *Hymenoptera*, or membranous wings, of which the bee has four. The members of this order, with few exceptions, are characterised by their providing and caring for their young, which at first are quite helpless. Its family is called *Apidæ* ; the insects of this family all feed their young upon pollen, or honey and pollen, and all of this family have the first joint, or tarsus, of the two posterior legs widened, which, together with a broad tibia hollowed out, and in the genus *Apis* fringed with stiff hairs, form a receptacle in which they carry pollen and propolis to their hives. This receptacle is called by bee-keepers the pollen basket. The honey bee belongs to this latter genus *Apis*, which is again sub-divided into a number of varieties.

14. Natural Habitat.—The honey bee, in England, has been so long associated with the straw skep that old-fashioned bee-keepers have long ago given up the idea as to any other form of outward architecture, and seem to be quite assured in their own mind that straw is, and always has been, the material from which its home has been, and ought to be, constructed ; so convinced are they of this, that upon the advent of wood hives they dubiously shook their heads and prognosticated a complete failure, simply because a straw hive was, according to their ideas, a more natural dwelling. We are frequently astonished at even advanced bee-keepers upholding this theory. Did our forefathers of many generations ago make straw skeps? We venture to assert that they did not, but preferred—as in many uncivilised tribes of the present day—to take their honey from the holes in trees, where the bee's natural home is to be found. Wood, not straw, is the bee's choice of outside architecture. We make our bar frame hives of wood. It is not our wish to assert that in all cases this desire on the part of the bees to build their combs in hollow trees is strictly adhered to ; but will simply say that any hollow space, be it in straw, wood, stone, brick, or any other material that will keep out the rain is the bee's natural habitat. Of course, straw would be, unless specially fashioned by man, the most unlikely material in which we should expect to find a colony of bees. There are a few varieties of the genus *Apis* who construct their combs without any covering, under the limbs of trees, notably *Apis dorsata*, of India and Ceylon. Even in our own country, an exceptional case here and there has occurred of such proceedings on the part of a swarm of ordinary English bees, but successful wintering has never been accomplished under such circumstances. The tribes along a portion of the Congo, in Central Africa, keep quantities of bees in rush baskets, suspended upon the branches of trees, and

remove the honey by means of frightening the bees with smoke.

15. Varieties of the Honey Bee.—We are not, in the present volume, at all interested in the varieties of the honey bee which have not been brought under our notice within our hives. We pass over the little, stingless bees of Mexico with supreme contempt, as, according to the experiences of several entomologists, they are simply miniature humble bees, or, as they are more familiarly styled, "dumble-dores," storing very little, if any, honey. The giant *Apis dorsata*—one would wish it could be acclimatised—with its worker-cells as large as the English drone-cells, albeit the drone is no larger than the worker—a famous storer of honey. We will now turn our attention to those bees most familiar to English bee-keepers.

16. The Black Bee.—First comes the well-known English (German) black bee, now rapidly being changed into a mongrel by constant crossing with imported varieties. All know this sombre little labourer, and, take it all round, one will find it difficult to beat as a hardy, industrious, and serviceable honey gatherer.

17. The Ligurian, or Italian Alp Bee.—This stands next in order of more general distribution over the British Isles; is a handsome, thrifty, and hard-working member of the family of honey bees. Our opinion of them is of the highest description; in our own apiary, no other variety of bees has given so large a return. At this season (1887), every Italian stock has beaten the blacks by quite 25 per cent. The manner of protecting their hives from robbers is most remarkable as compared with the English or black bee. With this latter, a half-hearted sort of resistance is made, perhaps only one sentinel bee beating off the would-be robber; but with the Italian, four, five, and even six sentinels will pounce down upon any single stranger trying to invade the precincts of their hive; not only will they attack them on the alighting-board, but will even venture to repulse them upon the wing. Go to the hive, and remove a frame—very little intimidation is required—and, when it is held up to the gaze, they remain so immovable on the comb that the discovery of the queen is an easy task. But, like all things, they have their failings; one of these is that, if you wish to shake them off the comb, they will not fall properly, but very diligently endeavour to spread themselves all over the apiary, as they take wing directly they fall from the comb. We remember on one occasion endeavouring to throw a swarm down in front of a hive—their future abode—when, to our great surprise, they distributed themselves on every available portion around the apiary: flowers, trees, walls, hives, each received its share; but, after a time, they collected together, and soberly walked in, to found a colony that we have never had beaten. The queen is about the same size as our English black bee, but differs very materially in point of colour. The body

colour is a light brown, the under part of the abdomen being quite an orange yellow, except at the tip; each segment of the upper part has a broad band of this colour on its anterior edge, giving it a striped appearance. The drones are much darker than the queen; they are rather imperfectly striped with a bronze yellow colour; they, on this account, are very easily distinguished from the drones of the black bee. The worker is a slightly smaller and sharper-looking bee than the black, and has the three anterior rings of the abdomen at their front edges, coloured with an orange-yellow band; the middle or second segment being much broader than the other two. When young, the hairs with which their body is covered are quite auburn-coloured, which gives the bee a very light appearance. They have also the anterior edges of each segment of their abdomen fringed with light-coloured hairs.

18. The Carniolan.—The Carniolan, or "Ladies' Bee," as some have termed them, is scarcely distinguishable—except by a close observer—from our own black bee. They have each segment of the abdomen, at its anterior edge, fringed with light-coloured hairs, which give it quite a silvery look. They are celebrated for their gentleness when handled; although we have found that they can use their stings, and, in some cases, very freely. We never did anything very extraordinary with them in the way of honey gathering, whilst their swarming proclivities are unfortunately very pronounced.

19. The Cyprian.—This is very much like the Italian, with the exception that they have a greater preponderance of yellow on their body; in fact, the whole under side of the abdomen is yellow to the tip. We have found these extremely irritable—in fact, so much so that we discarded them entirely, but mean to try them again, as, by careful selection, we are assured that this pugnacious feature is being gradually bred out of them. They are excellent honey-gatherers and feeders.

20. The Syrian.—This is a very similar-looking bee to the Cyprian. They are exceedingly prolific and active, and, to a careful bee-keeper, would prove quite an acquisition.

21. The Albino.—This, although frequently advertised for sale as a distinct species, is, without doubt, but a slight variation of the Italian or Ligurian, and may be passed over as of no more practical utility than its progenitors.

There are a few other varieties than those enumerated above which one hears of now and again, but those we have described are the ones chiefly claiming attention at the present time.

22. Kinds of Bee in a Hive.—A hive in a normal condition, during the swarming season, contains three different kinds of bees—viz., the queen, or mother bee; the drone, or male; and the worker, an undeveloped female. But, during autumn,

winter, and early spring, only two kinds populate the hive—the queen and the worker bees, the drones having been expelled.

23. Physiology of the Honey Bee.—A treatise on the anatomy of the honey bee would be rather foreign to the present volume, but some insight into the physiology will be found of great service to the bee-keeper, as placing him in a position to be able to support assertions which, without such a knowledge, would be almost an impossibility. This knowledge we have often found of great service to us in our arguments with the bee-keeper of, happily, bygone times.

24. The Queen.—We will give a description, in the first place, of the queen, or, more correctly speaking, the mother bee. She is the only perfectly-developed female in the hive. Her outward appearance is quite distinct from either a drone or worker. She is much longer—her length, when in the height of the egg-laying season, is about ⅞in. as against the length of a worker about ½in.; this length is principally caused by the size and length of the abdomen. Her wings, although as long as those of a worker, appear much shorter; this is but an optical delusion, caused by the contrast to the length of her body. Her jaws are weaker, and her tongue much shorter, than those of a worker. Her eyes, instead of meeting on top of the head, as a drone, are placed at the side, having quite a space between the topmost edges of each. Her two posterior legs are very broad, but do not have any indentation on the surfaces, or stiff hairs, which the worker has to form pollen baskets. She has a sting, but differing from the workers in its being curved scimitar-like, and also possessing a less number of barbs. It is quite a rare occurrence for a queen to use her sting when handled; in fact, only two isolated cases have come under our notice. Her legs and under portions of her body are much lighter-coloured than the workers or drones. Upon dissection, we find a still greater difference; the two air sacs of the worker are here partially displaced by two huge ovaries, communicating with which are two tubes or ducts, terminating in a single one, and thence to the outside of the queen's body; these are called oviducts, and form the channel whereby the egg is conveyed from the ovaries into the cell, when laying. Situated just below the junction of these two tubes, and communicating with the single tube, is the spermatheca, or receptacle for the spermatozoa from the drone at the time of impregnation. Leukart estimates that the spermatheca of a bee is capable of holding 25,000,000 spermatozoa. As connection only takes place once in the queen's life, it is necessary that there should be a receptacle to hold a sufficient quantity of the seminal fluid of the drone to fertilise

The Queen.

the enormous number of eggs laid by the queen. It has been estimated that, at the height of the breeding season, a prolific queen will lay from 2,000 to 3,000 eggs per day; each of these, before it will hatch to a worker or queen, must receive its share of the seminal fluid. If a queen should not meet the drone, which sometimes takes place through stress of weather, she will still lay eggs, and these same eggs will hatch, but all such will only produce drones, or males. This strange anomaly is called parthenogenesis, or virgin breeding. We often find very old queens producing but drones; this is accounted for by the fact that, the spermatheca having been emptied of its contents, there are no spermatozoa to fertilise the eggs, which fertilisation must take place before such eggs will produce workers or queens. In this case, the bees usually supersede the queen shortly before she has laid the last of the fertilised eggs; but how they can obtain a knowledge of this we are at a loss to know. As great doubts have been frequently expressed by many as to the possibility of there being such a condition of things as virgin breeding, we give a few proofs which are irrefutable. We find that unmated queens can, and do, lay eggs, and these same eggs hatch, but they always produce males (drones). Old queens, upon microscopical examination, are always found to be destitute of spermatozoa in the spermatheca. A very celebrated microscopist, Herr von Siebold, found that eggs laid in drone-cells were devoid of spermatozoa, whilst others laid by the same fertilised queen, in worker-cells, were found to contain spermatozoa.

25. Functions of the Queen.—The duties of the mother bee, miscalled the queen, are of paramount importance in a hive. She is the life; the success or non-success of the colony rests entirely upon her prolificacy or non-prolificacy. Each of the many thousands of workers, or hundreds of drones, owes its existence to this bee; she is the mother of the entire colony. Remove a queen from a hive, and after a short period has elapsed the bees will run about searching for her, not looking much beyond the actual entrance; but soon they will settle down, and commence constructing queen-cells over several young worker larvæ. These will be fed very plentifully with a specially prepared food, called by bee-keepers "royal jelly," and by this course of feeding will, in the space of sixteen days from the time the eggs—which otherwise would have produced workers—were laid, produce virgin queens. You will note by this that not only is she the mother of workers and drones, but also that of future queens. As her duties are simply the reproduction of her species, a bee-keeper will note the absolute necessity of having young and vigorous queens in his colonies. Directly the queen's powers of reproduction begin to wane, the colony must dwindle, and ultimately—if the queen

be not superseded by the bees, or man—perish. When a virgin queen issues forth from her cell, very little notice is taken of her by the workers; she has just to shift for herself. At the end of three days, weather being propitious, she flies forth from the hive, many writers say, to meet the drone; but this is very rarely the case. Her first flight is but a prospecting one; in fact, she will issue from the hive two or three times in quick succession on the same day, and will do this in some instances for several days before fertilisation by the drone takes place.

We have just now observed two instances in our own apiary where the queens have been flying for five days. In one case, we saw her issue and return four times during one afternoon, yet were only watching for an hour; perhaps she had made more flights than even this number. Shortly after fertilisation takes place—the time varying considerably with different queens—she commences to lay eggs; these are fastened to the bottom of the cell, at one end, by a glutinous substance, with which the egg is coated when voided. Often the first few eggs laid by the queen produce only drones, and, in exceptional instances, quite a large number of such eggs are laid; but having settled fairly to her duties, she will lay in the height of the season from 2000 to 3000 eggs per day. It has become quite an accepted fact among the old-fashioned bee-keepers, that the queen leads the swarm; this is entirely wrong. She may leave the hive at any time during the issue of a swarm, oftentimes one of the last, in some cases refusing to leave at all; the bees will then return to the hive: or maybe she leaves with the swarm, and returns again to the hive; in this case the bees return. Why is this? Not because she rules them, but, being the life of the stock, they cannot commence founding a new colony without her. If they had eggs or larvæ from which to rear another queen, very little notice of her leaving the hive would be taken. Remove a queen from a swarm, and place them in a hive furnished with eggs and young larvæ, the major portion will stop; but place them in an empty hive without the queen, and they will return to the parent stock. Hence, a knowledge that without a mother they perish causes them to follow a queen, but only when they have no means of rearing another. In rearing queens in "nuclei" (see "Queen-rearing), one must keep some uncapped brood in them; the inhabitants will not then leave with the queen when she takes her wedding flight; but if none or only capped brood is there, they, having no means of rearing a mother, will very likely issue with her. She will follow them, they will follow her, and thus both will be lost to you. Equally so is it the queen's desire not to be separated from a hive. Suppose, for instance, that in removing a queen from a hive you let her slip from your fingers; she takes flight, you think she is gone, and shut up the hive. Do

not do so; leave the hive open, and stand on one side; she is almost sure to return in a few minutes.

26. The Drone.—This is a very large and burly-looking bee. One can easily identify him if we go, about noon, on a fine sunny day between the end of May and the middle of July, to a populous colony. Listening, we hear a tremendous buzzing, and looking at the entrance we see the drones come forth, and, after a great deal of attention has been paid to wiping their antennæ with their anterior legs and their jaws, fly away with a regular booming sort of noise; their life is a life of pleasure, short-lived, it is true. The eyes of the drone are, in point of form, quite distinct from those of either the worker or queen, being much larger, and extending to and quite meeting on top of the head. The thorax and abdomen are very broad, the latter being fringed with a row of hairs at the posterior portion. Their jaws are weaker, and tongue shorter, than the worker; they also, like the queen, have no pollen-baskets. They are stingless. The drone is the male bee, its generative organs being very similar to those of most other insects. It is much longer than the worker, but less than the queen. The queen begins to lay drone eggs from the commencement of May until the middle of July: these, having been hatched and reared, remain as inmates until their services—mating with the queen—are no longer required; they are then driven forth by the worker bees, and allowed to perish outside. This takes place from about the middle to the latter end of July; at this time you will find quite a heap of dead drones underneath the alighting-boards of your hives, where they have died, after repeatedly endeavouring to gain a shelter from which they have been mercilessly expelled by the workers. In the case of a bar-frame hive where swarming has been retarded, the drones will be allowed to live until late in August.

The Drone.

27. Duties of Drones.—Various surmises have been made as to the duties of drones in a hive, besides the one important one—the fertilisation of the queens. Some have supposed that, being in such large numbers, they were there for the purpose of increasing the temperature, in order to evaporate the honey more expeditiously. We have removed all the drones from a hive, but have never been able to detect any fall in the temperature. If such is the case, why are not drones raised always before the bulk of the honey-flow sets in? they will be, without doubt, if the space of the hive is restricted, in which case there would be sufficient workers to keep up the temperature; but by contracting the hive we induce swarming. Hence the necessity of the drones to fertilise the virgin queens which will

be produced at the time of swarming. If they were reared for the sake of the warmth they are presumed to produce, one would naturally suppose that they would be allowed to remain in the hive all through the winter, or, at least, later in the season than they do. Presuming a hive has swarmed, and turned out the drones at the usual time, and the same is placed in a field of buckwheat during August, the bees would, if they required the drones for increasing the temperature for evaporating purposes, raise others; but they do not. We are strongly of opinion, that the duties of the drones are to fertilise the queens, and that only. The bees turn them out in July, those which swarm early being the first, as a rule, to accomplish this end; only in the case of a queenless colony—which usually collects very little honey—are they allowed to remain for any lengthened period beyond that date. A queenless colony requires the drones to fertilise the virgin queens, but which queens, when there are no eggs or larvæ to rear them from, are never produced, although the bees' instincts to preserve the drones for such an event are stronger than the knowledge of their condition; but introduce a fertile queen, and they are at once turned out.

28. The Worker.—This is an undeveloped female. It has strong jaws, so strong that it can chop up paper, cut linen tape, gnaw through straw, and, according to A. I. Root, of Ohio, U.S.A., can gnaw wood; this latter we have never seen, but, upon the word of such an observant bee-keeper, to negative it would be impolitic. We have, unfortunately, found that bass—the material used by gardeners for tying flowers—is as easily cut through, by their strong jaws as the plastic wax with which they form their combs. On one occasion, when transferring a stock, there being no tape obtainable, we used this material for tying in the combs; the next morning all this was gnawed away, the consequence being that most of the combs dropped out of the frames. Everyone knows the worker bee who has seen it in the garden or field, as it flits from flower to flower, in its eager search for either nectar or pollen. The smallest kind of bee in the hive, but doing the largest amount of work. It is about $\frac{1}{2}$in. in length, but when filled with honey nearly $\frac{5}{8}$in. It has, as all bee-keepers know, a sting; this sting, instead of being curved like the queen's, is quite straight. One can very easily make the bees expose their stings, by turning back the quilt of a bar-frame hive, and allow the breath to enter; instantly a number will unsheath them, each with its tiny drop of poison near the tip, turning them by a movement of their bodies upwards. The smell of this poison is quite discernible, even at a distance, and seems to infuriate other bees,

The Worker.

as, when stung on a garment, where the poison evaporates quickly, and thus gives forth its odour, others, until then well-disposed, will instantly commence to buzz around, and insert their weapons where not needed. The worker has most of the generative organs as in the queen, but in a very rudimentary form. The compound eyes are set well apart, the ocelli, or simple eyes (three), being easily discernible, with a strong magnifying glass, on the forehead, between the two compound eyes. It has pollen-baskets, one on each of its two posterior legs, in which it carries pollen and propolis to the hive. The tongue of the worker is much longer than either the queen's or drone's; hence we see its adaptability for gathering the nectar from the innermost portions of the flowers. On the underneath, and under the articulations of the abdomen, there are receptacles called wax-pockets, in which, when comb building, the wax is secreted, in the form of small scales looking not unlike fish scales; these are removed by the bee, and kneaded by its jaws, assisted by its anterior legs, into ribbons before forming into comb. It has a receptacle in the anterior portion of the abdomen, called a honey-sac, in which the nectar from the flowers is collected, and transformed, by a chemical action, into honey; it is also there partially separated from its watery element while the bee is gathering; this can be easily observed by watching a bee on the wing voiding the water so abstracted. Although in a normal condition the worker bee does not breed, there are exceptional instances where a worker or workers, in a queenless colony, will partially usurp the queen duties, and lay eggs; but in every such case these eggs produce drones. They are then called "fertile workers." Whether the drones thus produced are capable of fertilisation is a moot point, and has not yet been satisfactorily determined.

29. Duties of Workers.—What a multiplicity of employments! A perfect "Jack of all trades!" All the various and multifold duties appertaining to the well-being of a colony are performed by these industrious little labourers. Directly, or within a few hours of emerging from the cells, work is their portion, continued without intermission until the time when, with torn and battered wings, they are cast out as of no more use. They have worked and worked, living only for work, and dying only when nature is completely exhausted and worn out. When a worker egg is laid in the cell by the mother bee, it hatches in three days; it is then fed, in the larval stage, for seven days. Having grown to its fullest size, it is capped over by the bees with a mixture of pollen and wax; this being of a porous nature, allows the immature insect to obtain the requisite amount of oxygen to support its existence. At the end of twenty-one days —twenty days in warm weather—it issues forth, a lightish-coloured,

downy little creature. It spends the first twelve hours of its existence in idleness, but directly after commences to act the part of nurse to the larvæ, feeding them with as much assiduity as one would suppose appertained to an older head; this employment is continued for about a fortnight. If there is any comb-building going on, it will take its turn at this; but at the end of this time it goes forth to collect honey and pollen, wherewith to nourish its fellows of the hive. By this you will note how much better it is to examine a colony in the warm part of the day, if honey is coming in, as then the old bees (the ones that sting) are foraging in the fields, leaving the youngsters at home, who are more easily dealt with. By it the honey is collected and brought into the hive, where it is disgorged into the cells prepared for it. Pollen is gathered from the stamens of the flowers by means of the anterior legs and hairs of the worker's body; and, while the bee is poised on the wing, it is removed and transferred to its mouth, and then on to its posterior legs. When the bee has thus formed two huge, bright, coloured lumps, it flies back to the hive, and places it in a cell, there to be properly packed by the other bees, until it is wanted to feed the numberless immature bees waiting for it. The worker collects the propolis in much the same manner, and carries it into the hive, where it is removed from its legs by the other bees, and then used to stop up all crevices, or fix any loose portions of the hive. The worker-bee is the water-carrier, and keeps the hive well supplied if it is obtainable within a reasonable distance. Another important duty is performed by the worker—that of ventilation; watch a hive at mid-day, and note the vigour with which the several bees at the entrance fan, with their wings, the cool, refreshing air in; others in the inside are doing their duty by fanning an equal quantity of hot, vitiated air out. The removal of all *débris* and filth is another important sanitary occupation which devolves upon the worker bee; in this, as in all things, its great industry develops itself. Note a bee struggling with the corpse of a deceased member, and then flying off with the same, dropping it some distance away from the hive. All little pieces of comb, or foreign matter of any description, are laboriously removed to the outside. The worker-bee stands foremost as the most wonderful type of an insect-architect and builder, although the idea that it makes the cells hexagonal, with such geometrical precision as we see them, is, according to our ideas, a fallacy. The hexagonal form is produced by the pressure from the surrounding cells, as, when first commenced, they are circular. Look at the outermost cells of a comb just commenced; they are circular at their outside edges; it is only when they meet the walls of the surrounding cells that the hexagonal form is produced. A queen-cell is circular; it has no surrounding cells to produce the hexagonal form. The worker-

bee is the soldier, the policeman—in fact, a perfect vigilance committee in itself. No robber dare venture to confiscate its treasure ; if attempted, it is repelled with great energy. The useless bees of the hive—those who, through some malformation, are unable to perform their share of the work—are ruthlessly cast out. Queen-cells, with their larval contents, when not wanted are cut down and removed. The providing of wax for comb-building is exclusively the task of the worker-bee, and is principally performed by the younger members of the community.

IV.—PRODUCTS OF BEES.

30. Honey.—Honey in its crude form—nectar—is the produce of flowers, and, in some few exceptional instances, notably the laurels, the leaves of shrubs. In the form of nectar it is met with in varying quantities in all flowers fertilised by insects, and is produced by Nature as an inducement for insects to visit these flowers that they may be, by their instrumentality, rendered capable of the reproduction of their species. By many it is supposed that, not only is the nectar produced for this purpose, but also for nourishing the young seeds in their early growth. The ground for this supposition lies in the fact that many flowers produce nectar even after they have been properly fertilised ; whether such is the case it would be foreign to this work to endeavour to substantiate. The nectar in the flowers, before being gathered by the bees, is of a very thin consistency, being largely charged with water ; this is separated by the bee as alluded to before ; it is then placed in the cells, and, after being evaporated by the heat of the hive, is sealed over, and is then called by bee-keepers, "ripe." A large proportion of the honey is fed to the larvæ in its unevaporated form, after being mixed with a certain proportion of pollen (bee-bread). It will be noticed by this that during the honey season less water is consumed by the bees, on account of the quantity already contained in the honey ; hence, bees require less water provided for them at this season, in comparison to the quantity required in early spring, as then old, evaporated honey, is only obtainable by them.

31. Wax.—Another product of the bees, second only in importance to honey, is wax. This is a solid, fat-like material, produced in the form of scales, in what are termed wax-pockets ; these pockets are receptacles under the abdomen of the bee ; there are four on each side. When combs are required to be built, the bees hang in festoons from the point where the comb is to be attached, thus forming a plumb-line with their own bodies, from which to build their comb quite perpendicular. While hanging thus, the secretion of the wax takes place in the pockets ; it is then removed by

Abdomen of Worker, showing Wax-pockets and Wax Scales. (Enlarged).

the bee's anterior legs, assisted by a peculiar motion of the body, and carried thence to the mouth, where it is moulded into ribbons, and then adjusted to any particular portion of the combs required. When comb-building is going on, a quantity of these scales are dropped on the floor-board of the hive; they can then be examined, and will be found to be in the form of an irregular pentagon (five-sided figure), not unlike fish-scales, or flakes of spermaceti.

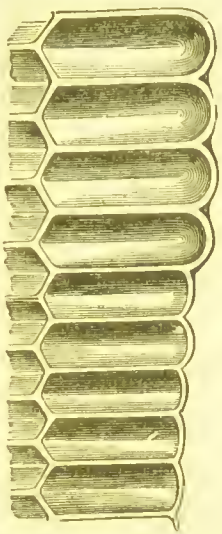
32. Pollen.—The nitrogenous portion of the bee's food is called pollen. This can scarcely be called a product of the bee, as it is gathered from the stamens of the flowers, and in its original condition conveyed, on the two posterior legs of the bee, to the hive. When a bee arrives in the hive with its load of pollen, it proceeds to a worker-cell, and, placing its legs in the cell, it scrapes the two pollen balls off, and leaves them there, to be packed by the other bees; these cells are very rarely filled with pollen, a number being partially filled, and honey placed on the top. We are very much of opinion that such proceedings are essential for the preservation of the pollen through the winter, as, in the springtime, where the honey has been consumed from off the top, it quickly mildews, and forms into a solid, white substance; which, in the form of hexagonal pellets, are frequently seen cast out of the hive at this season.

33. Propolis.—This is another material collected—not produced—by the bees, principally from the buds of resinous trees and shrubs, such as firs and horse chestnuts, and packed by them in their pollen-baskets. When taken to the hive, it is removed by the other bees, and drawn out into thin lines, and then used to stop up all crevices, affix loose portions of the hive, and cover over any noxious substance that is too heavy for removal from the hive, thus forming an hermetically sealed casing. It is never packed by the bees in their combs as pollen. Although principally collected from trees and shrubs, the bees will also remove it from old, disused hives, or varnished materials. We once saw a hive, which the owner had taken great pains to varnish, literally covered with bees, who in time removed nearly every scrap of varnish from off it. Autumn is the chief time for bees to propolise their hives, no doubt to keep out the severe weather expected during winter.

V.—COMBS.

34. Worker-combs.—These are built by the worker bees entirely of wax, and vary in shape very considerably, in order to accommodate them to the position they occupy in a hive or other place. They are constructed of numerous hexagonal cells, branching out almost horizontally from each side of a midrib, or septum. The worker-cells are about $\frac{1}{5}$in. in diameter, there-

fore five of them will occupy an inch of lineal space; by this we can compute how many larvæ the combs will accommodate, as in each square inch of comb fifty bees can be reared. The cells are not quite horizontal, but have an upward tendency, not so perceptible in the brood as in those cells used for the storage of honey, although both are used indiscriminately, when required for either. In an ordinary size (15in.) straw skep, eight of these combs are usually built; the measurement from centre to centre of two combs is $1\frac{9}{20}$in. Their positions in the hive vary very much according to chance, being found built in a line with all points of the compass. There is an idea prevalent that bees always build their combs at right angles to the entrance; this will be found to be erroneous, as, in many thousands of hives that we have examined, every angle was used, and in many cases two, and even three, angles were built to in the same hive. When worker-comb is used for brood purposes, only workers are produced in the cells—that is, if the hive is in a normal condition; but if a queen is a drone-breeder, drones will be reared in the same size cells as workers; or if a fertile worker is in the hive, the same results will happen. When worker-brood occupy the combs, each cell is capped over, after the feeding of the larvæ is completed, with a mixture of pollen and wax; the appearance of these cells then is entirely different to either honey or drone comb; the cappings are a shade lighter than the surrounding comb, having a slight convexity of surface, with a dead colour. They are closely packed together, forming a solid mass of brood—called the brood-nest—in the middle of the hive, but more inclined to the bottom and front, and forming almost a sphere if a line is struck from comb to comb on its outer edge. When honey is stored in worker-cells, the cappings are irregularly concave, and have a shining appearance, as against the dead colour of brood-capping, in consequence of their being formed of wax only.



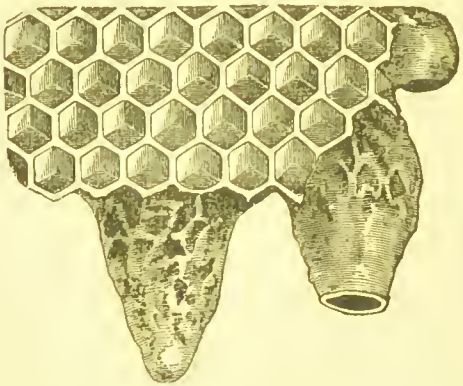
Drone and Worker Cells, showing the relative Size and Shape of Cells after Capping.

35. Drone-comb.—This is exactly similar in shape to worker-comb, but the cells are much larger, being $\frac{1}{4}$in. in diameter; thus, four cells occupy an inch of lineal space, and thirty-two drone-cells are contained in a square inch of comb. When these cells are used for brood, they are capped over with the same material as those for workers, but entirely different in shape—each cell is domed over, these domes standing in relief

from the surface of the combs nearly ⅛in.; thus a provision is made for the greater length of the inmates.

36. Honeycomb.—Both drone and worker comb are used indiscriminately by the bees for the purpose of storing honey. The cells surrounding the brood-nest, on top and on both sides, are used for honey; but they rarely store it below the nest, in close contiguity to same. When honey is stored, wax is used for the cappings. Pollen is also stored in the same cells as honey, but only in worker-combs. When honey is very plentiful, any fresh comb made for its accommodation will be usually built in cells of drone size. The length of honey-cells varies considerably; instead of being about ½in. in depth, as for brood, cells of less and also greater depth will be found. We on one occasion saw honey-cells which were 2½in. deep; when such a depth is attained, the cells will be found to be very irregularly formed.

37. Queen-cells.—These form a portion of the comb at certain seasons. They are composed of wax and pollen mixed, and are totally different in shape to any other cells in the hive. When the bees are about to build queen-cells, they choose the edge of, or, preferably, a hole in, the comb, and after an egg has hatched in a worker-cell, in this position, and been fed a few hours, they construct, by enlarging the side walls,



Worker-comb with Queen-cells commenced, before Capping over, and after, showing Indentations on Surface.

Queen-cell with Hinged Cap, after Exit of Queen.

a dome, not unlike an acorn cup; in this is placed a quantity of food for the larva, which floats, or rather adheres, to this food. During the course of feeding, the cell is gradually elongated downwards, and when it is finished it is capped over, looking then something like a perfect acorn hanging downwards. On some occasions, as in a colony with no worker larvæ, the bees will endeavour to rear a queen from drone larvæ; in this case,

the cell or cells are built in abnormal shapes, and their surface is smooth, as compared with the indented surface of a normal queen-cell.

VI.—MODERN BEE-KEEPING.

38. How to Commence.—Before commencing, the prospective bee-keeper should thoroughly study the art, by reading some good modern bee publication. Do not read more than one, as a complexity often mystifies, in order to master which, the assistance of a friend—an adept in the business—should be requisitioned. If it should be the summer season, a few lessons in a good apiary will be of assistance ; these are easily obtainable. A visit paid to one or two of the numerous agricultural or horticultural shows where bee-keeping forms a portion of the programme, will be time well spent, especially if it is in the company of a bee-keeper who does not mind giving some information respecting the exhibits. Having sufficiently mastered the preliminaries, a hive should be purchased ; now mind, not two or three, but only one. With this hive go through all the details of its management—without the bees—until you have gained a knowledge of all its parts and uses. Then further purchases can be made, as follows : a stock or swarm of bees; a fumigator, or smoker—preferably the former; bee-veil. If you purchase a stock, you will want five sheets of "foundation," but if only a swarm, ten will be needed.

39. Purchasing Hives.—In the matter of hives, do not, on any account, purchase one that has not Association standard size frames, as another size will only be worth the price of so much firewood. The whole success of the modern bar-frame hive rests upon its interchangeability ; therefore, if you have two sizes in your apiary, you might almost as well have all straw skeps, as their non-interchangeability, on account of the different sized frames, nullifies the advantages of the modern system. Let me very strongly emphasise this latter. Do not purchase any hives that the bees have died in, unless you know positively that they have been starved, or have died out from the loss of queen ; if they have died from disease, it is sure to be a contagious one.

40. Purchasing Stocks.—The variety of bees I should strongly recommend to be purchased are pure Italians, as they are much less trouble to handle than English, and are a deal less irritable. If you purchase these from a distance, have them from some responsible and thoroughly reliable person, as perhaps only hybrids may be sent, or diseased stocks ; in the event of the latter, all your prospects of bee-keeping will be destroyed, as well as nearly all the money you have spent in necessaries being wasted. In purchasing stocks, be sure that they are very strong, and endeavour to obtain those with straight

combs, as, in the event of your wishing to transfer them, they will be found much the best and cheapest. Those skeps having sticks thrust across them will usually be found to have crooked combs.

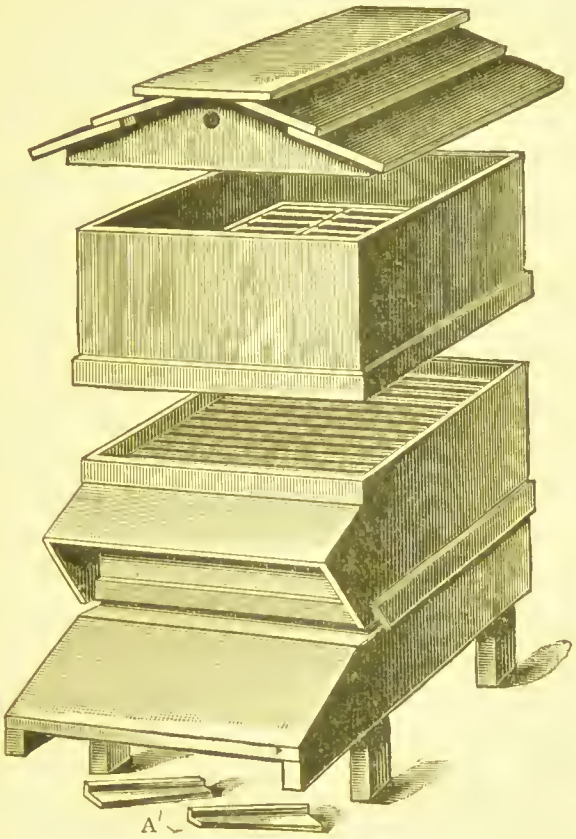
41. Location.—Choose a good location for the hives to stand in. A south-east aspect is the best, if you can provide shade for them during the middle of the day; this is very essential, unless made with double walls, and painted white or a very light colour. We are obliged, on account of the number we keep, to disregard the service of shade, but have all the hives painted a light stone colour, with white roofs. On not a single occasion have we had an accident from the heat. Do not place them close against a wall, but leave a clear path of at least 3ft. behind, and have the front clear from grass or weeds. It is a very good plan, in order to make this clear space in front, to dig out the earth, and fill in with tar and rubble, sifting some grit sand on the top, to make all neat. This is of great service to the bees, as, when coming home heavily laden, the wind will frequently blow them on the ground; but by having the front clear they can, after resting, easily take wing again, whereas with damp grass or weeds they get chilled and perish.

42. When to Commence.—The best time of the year is about the commencement of April, if you are going to start with a stock of bees; but if a swarm, you will have to wait until June; if so, you are very unlikely to get any surplus honey the same season. The English honey season being so short, they will only have time to get sufficient for their winter's consumption. This does not apply to places where heather or buckwheat honey is obtainable; nor is it always the case, as an early swarm in May will give a very good account of itself if attended to (see par. on "Swarming"). We have, on several occasions, taken from 20lb. to 30lb. of super honey from a swarm of the current year. Let me here caution my readers to be very careful in purchasing stocks during early autumn, as novices will not infrequently send swarms of that season, whose combs are so soft and laden with honey that they will not bear the rough usage incidental to a journey, and will break down, drowning all the bees; but if such stocks are very near at hand, no fear need be entertained, if moved carefully at night.

VII.—APPLIANCES.

43. Bar-frame Hives.—"What description of hive would you recommend?" How often this question is asked! The first thing to be considered is the size of the frames. They must be Association standard size, for obvious reasons, mentioned before. All parts must be made to fit each and every

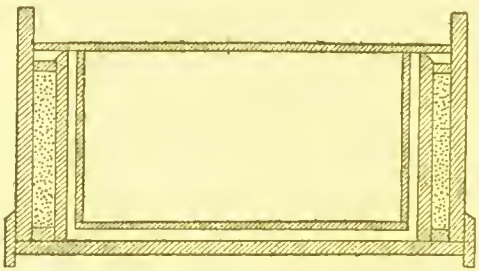
hive. There must be no sorting required—as to which rack belongs to No. 2, or what dummy-board belongs to No. 8. If you pick up a portion, it must go into any hive you require it for. We have illustrated a bar-frame hive in which all the complications of several on the market are done away with. It is just a simple affair—can be understood in a few minutes. All parts are not only interchangeable with other hives, but also with itself. No extensive winter packing is required, but just enough thickness to ensure warmth when snow lies thick on the ground. It can be enlarged to any size—not longitudinally, as that is not wanted, but horizontally; a good roof, with eaves overlapping, and water-tight joints, preventing that bane to successful wintering, dampness.



Bar-frame Hive.

We will now give a description of this hive, commencing with the lower portion: This, as will be seen in the illustration, has the floor-board and stand in one piece, and is supported by four short legs. Upon this is the body-box, having double walls at the sides, and in the space between the walls, not occupied by the wood blocking, sawdust or other non-conducting substance is packed. The outer wall is 11in. high and $\frac{7}{8}$in. thick, and the inner one $8\frac{1}{2}$in. by $\frac{1}{2}$in. The distance between the two inner walls is $14\frac{1}{2}$in. and between the outer 17in. full. The measurement from back to front is 18in. All the foregoing are inside measurements; the outside need not be exact but the inside must be. By having an inner wall on each side of the hive of a lesser height than the outer, the top edge of the former

forms a rest for the frames to hang upon, as the annexed sectional illustration shows. The outer wall, being 11in. high, reaches above the tops of the frames just over 2in., and thus forms a space for packing the quilts on the top of the latter. Some bee-keepers do not care for this space, using the riser to provide packing accommodation instead, but we prefer it as illustrated. The frames (see p. 26), ten in number, hang in the hive one behind the other from front to back, and are kept at a proper distance apart by distance-keepers called "metal ends," which fit on to the "lugs" of the frames. If you will compare the size of a frame with the dimensions given above for the inside of the body-box you will find that there is a space of ¼in. between the sides of the hive and the end-bars of the frames, and a space of ⅜in. between the bottom bar of same and the floor-board of the hive; this is the "bee-space," allowing the bees access to any of the combs or to any part of the hive proper. Behind the last frame is a division, sometimes called a "dummy" board; this fits the inside of the hive, that is, it is 14½in. across and 8½in. deep. It has a top bar nailed on as a frame has, and is cleated at both ends to prevent warping. By inserting this at any part of the body-box, from back to front, the capacity of the latter can be adjusted to suit the requirements of the bee-keeper. The front wall of the body-box is ⅜in. shallower than the back, but is nailed in position flush with the top edges of the other three walls; thus an entrance is formed ⅜in. high right across the hive at the bottom. Above the entrance is a piece of wood "rabbeted" for the two slides (A) to run in. The slides are used for adjusting the size of the entrance. A porch, having a water gutter along its front edge, keeps the rain from blowing in the entrance. The alighting board should be broad, reaching within a short distance of the ground.



Sectional View of Body-box of Frame Hive with Frame adjusted.

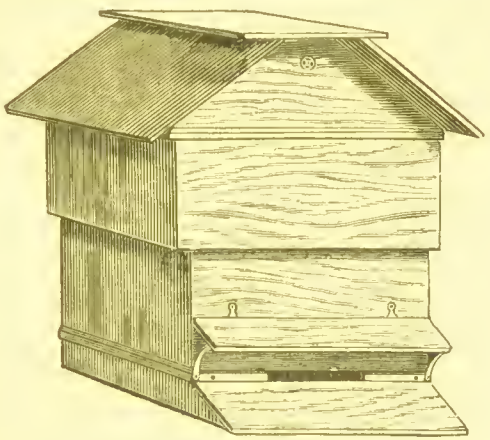
The next figure in the illustration (p. 23) above the body-box is the "riser." This consists simply of four pieces of ½in. (not thicker) wood nailed together for the purpose of covering the supers when on the hive. It is made just a shade larger than the body-box, so that when the plinths are nailed on the bottom edges, they just fit over the outside edges of the latter, and thus make the junction weather-tight. This must fit fairly loose, so there will be no difficulty in lifting it on or off during wet weather. Any moisture causes the wood to swell to

some extent, no matter how well it is painted. The height of the riser is immaterial, as if made shallow others can be provided to increase the height We use them from 9in. to 11in. high.

The illustration shows how the roof is formed. It is made of ¾in. stuff, and has a ventilating hole at back and front under the eaves at the top of the ridge; this is covered with wire gauze to prevent the ingress of insect pests. The ventilators allow of the escape of moisture which would otherwise accumulate in the inside during winter, and so cause dysentery among the bees and rotting of the quilts. The roof is made of a size to just loosely fit over the riser without plinths. There is a "stop" all round the inside ¾in. from the bottom edge; this rests on the edge of the riser when the roof is in position.

All our hives stand upon platforms of creosoted wood. These platforms consist of two pieces of yellow deal 11in. by 24in. by 1in., battened together. There is a great difficulty in getting the boards creosoted; in this condition they are practically indestructible, except by fire; if they are coated instead with hot gas-tar and then covered with hot sand they will last for years.

A cheaper form of hive for cottagers' use is here shown. The floor-board, made of ½in. pine, rests upon two battens, 3in. by ¾in., placed edgeways and sloped at the front end to support the alighting-board. The body-box is formed of four pieces of pine, the front piece being 17in. full by 10⅝in. by ¾in., and the back 17in. full by 11in. by ¾in. The two sides are 17½in. by 11in. by ½in., and on three sides there are plinths 3in. by ½in. The inner walls are 16in. by 8½in. by ½in.; the spaces between the inner and outer walls are not blocked in with wood, but are filled up with sawdust or chaff. This body-box must be fitted up with ten frames and a division-board, as in the hive last described. The riser consists simply of four pieces of wood nailed together; the front and back pieces being 18¼in. by 11in. by ½in., and the sides 18¾in. by 11in. by ½in. At ½in. from the inside bottom edge a stop is nailed all round, so as to rest upon the top edge of the body-box when placed in position. This riser during winter can be made to cover the body-box, by removing the porch, which is not a fixture, and inverting the riser over the body-box, thus adding materially to the comfort of the inmates. The roof is



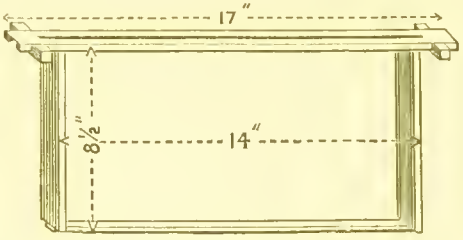
Cottager's Bar-frame Hive.

made of ½in stuff, and fits over the riser. This hive will accommodate three tiers of section-racks or two of shallow frame supers. If you desire to add a larger number of supers than this to the hive, cover the exposed supers with sacks, tie the loose ends tightly round the riser, and place the roof over all ; although, perhaps, somewhat unsightly, this arrangement is economical and effective.

44. Dummy-boards.—All dummy-boards to hives should be prevented from warping by having battens, or end pieces of wood, nailed on in an opposite direction to the grain of the wood. The boards are preferably made with cushions on each edge, preventing sticking, and adapting them to any inequalities of the hive.

45. Quilts.—We are strong advocates of enamel (American) cloth quilts next the frames, placing them on with the enamel side down. They are quite a boon, especially with very irritable bees, removal being comparatively easy—so different to woven material, which is usually fixed so firmly by the bees that they become irritated before one can remove it from off the frames. When using these quilts, it is essential that plenty of warm coverings be placed above them, and that the stocks be very strong, or the condensation of the atmosphere will produce too much dampness. In the matter of quilts one cannot err on the side of too large a quantity or too great a thickness. Cover the frames up as thickly at one season as the other ; the bees will appreciate the comfort of a thick covering when the sun's scorching rays beat down upon the hive, as they will when the perishing north-east wind blows furiously through the apiary.

46. Frames.—As before recommended, all frames should be the Association standard size ; the illustration will give you this. All are outside measurements. The top bar is ⅞in. thick, the side bars ¼in., and the bottom bar ⅛in. Shallow frames are frequently used for extracting purposes ; these are simply made like brood-frames, but shallower, 5½in. from top to bottom bar. The object is that a whole set of these combs may be placed on a hive without a too sudden or great enlargement, which would be the case if a set of standard frames were placed on in a like manner.

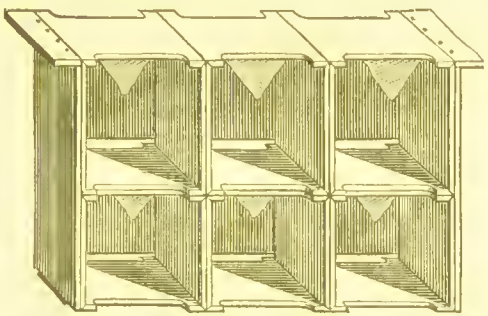


The Association Standard Frame, with Metal Ends.

47. Frame Spacing.—It is the custom of many advanced bee-keepers to space their frames in the hive by the eye, assisted with the tips of the fingers ; this can easily be done with a little practice, but it is not advisable for beginners to attempt this. All should use distance-keepers—the distance from

centre to centre of combs should be $1\frac{9}{20}$in.—of which there are a great variety on the market. We will therefore enumerate some of the chief, and recommend those which in practice have been found most serviceable. To commence, we must note that the most ancient were pieces of wood tacked on each side of the ends; or else they were cut out of the solid wood, to form half-space—the frames resting on zinc runners in the hive. The next advance (?) was having the full space blocks on each end of opposite sides of the bar; this, in our opinion, was a retrograde step, although it is used at the present time by many; but their disadvantages are being gradually found out. At about the same time wire staples were introduced, and are used in a few hives now, although these are but a poor contrivance at the best. A great advance was made by the introduction of solid metal ends (under this separate heading we will describe various makes of these). No bee-keeper who has used these will ever revert to the former contrivances; the only alteration likely to be made will be to do without any spacing guides at all.

48. Broad Section-frames.—Broad frames are used for what is called back supering. They are of a size to take six $4\frac{1}{4}$ by $4\frac{1}{4}$ sections, as illustration. The "separators" are strips of zinc (No. 6), tacked across the two rows of sections. These frames are gradually going out of use in England, as all advanced bee-keepers "tier up" their hives instead of supering laterally, the former being found to be much the better plan. The width of frame entirely depends upon that of the sections used, but, as almost all sections are 2in. wide, this size is the usual one made.

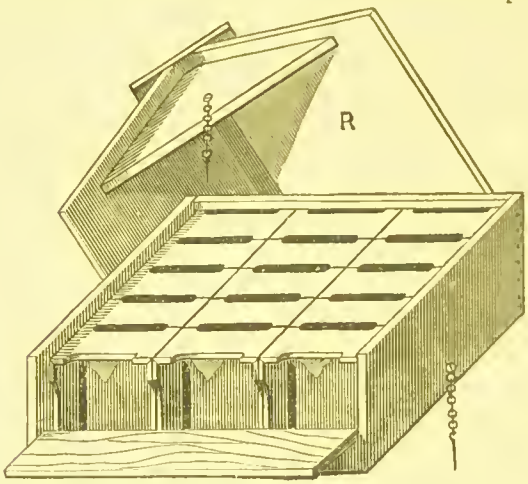


The Broad Frame, with Sections fitted with Foundation.

49. Supers.—The varieties are legion. In a box, no matter of what material made, the bees will store their surplus honey; but as this work is intended solely for the advancement of modern bee-culture, we will confine ourselves to a description of those supers used by advanced apiarists, not only on account of their simplicity, or ease in management, but also for their adaptability to the production of honey in the most saleable forms.

50. Skep Super.—We have until the present given only a description of bar-frame hives and their adjuncts; but here, as

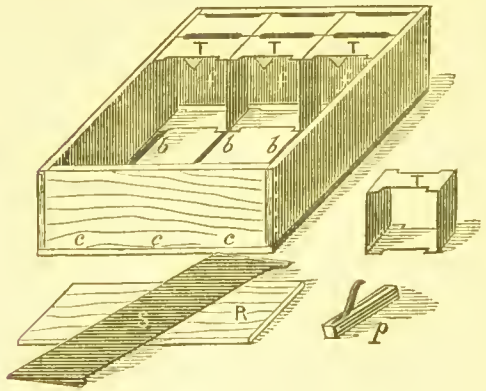
the old-fashioned bee-keeping becomes merged into the modern—a sort of connecting link—we illustrate a super adapted to skeps for the production of comb honey in a form equal to that produced in a bar-frame hive. For this rack we took First Prize at the Windsor Show of the Berks Bee-keepers' Association, 1887.



Skep Rack with Roof, for use in Straw Skep.

With a straw skep having only a hole in the top, an ordinary rack of "sections" (par. 52) could not be used; therefore, it has a bottom (not shown in the engraving), with a hole to correspond to the one in the skep. It also has a roof (R), to protect the sections from the weather. We took forty-nine 1lb. sections from one skep by means of these—using two, "tiered" up (see paragraph on "Tiering"). The arrangement of sections in it is precisely the same as in a rack for a frame-hive.

51. Frame Hive Super.—The accompanying illustration will give a good idea as to the form adopted in a super, or, as it is called, a rack or crate, for a bar-frame hive. This consists of a square box without top or bottom, and of sufficient size to accommodate twenty-one 1lb. sections (T, T, T). A space of ¼in. between the bottom of the sections and the top bar of the frames, for the passage of the bees, is called the "bee-space"; if this space is more than that measurement, the bees will build combs between, and so very firmly fix the sections to the tops of the frames, and if it is less, they will glue them with

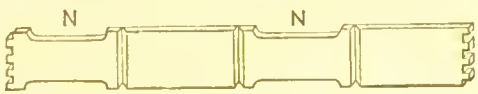


Sectional Supers on Rack or Crate, with Fall Over, Spring, Sections, and Separators.

propolis—so that a happy medium will result in clean section bars, and an easy removal from rack. This space is formed by four bars (*b*, *b*, *b*), placed from end to end of the box, exactly $\frac{1}{4}$in. thick; the ends being spaced by the same thickness of stuff (*c*, *c*, *c*) being nailed on between each of these bars, the sections thus rest entirely on these bars by their bottom side edges. If these sections were placed in the rack side by side, combs would be built along, across, diagonally—in fact, every way that we did not wish them so to do. In order to regulate their comb-building, pieces of foundation (*f*, *f*, *f*)—a description of which will be found under heading "Foundation" (par. 53)—are fastened to the top bars of the sections; the comb will be then built to the exact line that the foundation is laid to. We thus get straight combs if this is put in straight. But even then the combs would be built one into the other; therefore, to prevent this, separators are used (S). Across and between each row of sections a strip of thin (No. 6) zinc, called a separator or divider, is placed. The bees work at the combs until they have approached these sufficiently near as to allow of only one bee-space between the separator and comb; the section is then capped, and so finished off with a flat surface. In order to keep these sections close together, an oblong piece of wood, called a follower (R), is placed across the last row of sections, which is kept in its place by one or more springs (⌀), fitted into a small block of wood. One of these, in the centre, we find quite sufficient.

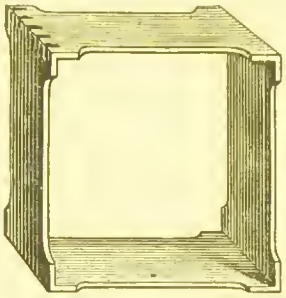
51*.—Shallow Frame Supers.—A great advance has recently been made by the introduction of shallow frame supers, used exclusively in the production of extracted honey. This super consists of a shallow box, in which fit either eight or ten shallow frames; the frames are of exactly the same shape and make as those in the body-box, but are only $5\frac{1}{2}$in. deep, consequently the box to contain them must be $5\frac{3}{4}$in. deep, so as to allow of a bee-space between the tops of the frames in the body-box and the bottoms of those in the super. The frames are spaced by means of metal ends, but either of two sizes of these ends can be used, viz., "wide" or "ordinary," according as the bee-keeper desires thick or ordinary combs. When using a super of this description it is imperative that an "excluder" be provided.

52. Sections.—Quite a number of individuals have laid claim to having first originated these; it will be sufficient for our purpose to inquire into the present manufacture. They are made entirely by Canadian and American firms, for the simple reason that wood of the description most



One-piece Section Unfolded.

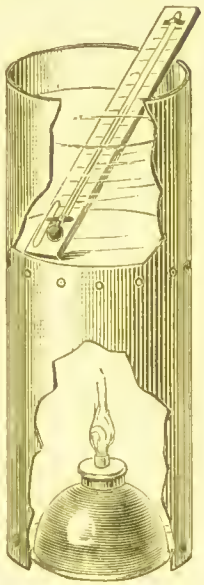
suited is not obtainable in the British Isles; therefore, all sections of any worth are imported from Canada and the United States. The best are made in one piece, having a V cut (F, F, F) where each fold is to take place, the two ends being square-dovetailed; when, by simply—having first wetted the reverse side of the V cut—bringing the two dovetailed ends together, it forms a small box without top or bottom. The top and bottom bars are made narrower than the sides (N, N). This is to form a passage, when the sections are placed close together, for the bees to enter from the hive below. In the autumn of 1886, four-bee-way sections were introduced, as it was presumed that the bees, having passage-ways all round the comb, it would be easier for them to pass from one comb to another, and finish them off quicker and more perfectly; it has these advantages, but in a very minor form. We used them with advantage during 1887, but we should not advise any bee-keeper to go to the expense of altering his plant to suit them. When such sections are used, the separators have to have a slot cut in them, just at the point where the side passages occur.



Four-bee-way Section, Folded.

53. Foundation.—This, although but recently used in any very large quantities, was invented as far back as 1857, by a German, and further perfected in America, notably by A. I. Root, of Ohio. It consists of sheets of beeswax, impressed by means of a machine with the shape of the base of the natural cells. The machine is made with two rollers, in a framework having gearing for raising or depressing the upper one. The wax sheet, after being warmed to render it more plastic, is placed between these rolls, which are moulded so as to give the required form, and, after being subjected to the necessary pressure, receives this impression. It is one of the most valuable adjuncts to modern bee-keeping; without it, honey in the form and quantity in which we see it would be unknown. The wax of which this is made must be absolutely pure beeswax. The price of such wax having, on account of the large demand for same, risen so considerably lately, and the price of foundation declined, has given rise to a considerable amount of adulteration with some descriptions of earth, wax, and fats. Beeswax melts at a temperature of 146° Fahr., while the melting point of other wax and fats is much lower. This adulterated foundation will not stand the internal heat of the hive, and so sags, or breaks down; in which case it is most likely to destroy all or most of the bees in the hive, drowning them in the honey which has been stored in the combs.

The bees will work out adulterated foundation almost as readily as pure. There is no doubt that bee-keepers are bringing this condition of things upon themselves. Many will have their foundation of a high colour in the case of stock, and perfectly white in that of super ; they seem to forget the fact that perfectly white beeswax cannot possibly be obtained without subjecting ordinary coloured wax to a chemical change. The least deleterious method of doing this is by exposure to sunlight ; but this entails so much labour, that it cannot be produced at the price charged for the foundation. The wax has to be made into thin sheets, exposed to the light for two days, then re-melted, made up again into thin sheets, again exposed to the light, and then melted into blocks. In consequence of the expense attending this process, other wax, or a mixture of chemically bleached beeswax with paraffin wax is used. Some super foundation we have tested had a strong odour of tallow. This was made from Cera japonica without a particle of beeswax in its composition, and was exhibited at a very large show as pure. As this wax is eaten with the honey from sections, bee-keepers cannot be too particular that they obtain the genuine, unpolluted article, which, as foundation, is never white. In the case of stock foundation the same system occurs, bad-coloured wax being bleached, re-coloured, and scented, to make up for the loss of aroma in the bleaching process. Chlorine will bleach wax, but it makes it very brittle. The following rough method of testing wax by its specific gravity will be found of service. Take a 6oz. vial, and half fill it with gin ; then obtain a piece of beeswax that you know is pure, and, after kneading it into a ball about as large as a pea, drop it in the gin ; it will sink to the bottom, as a stone ; gradually add water to the gin, keeping it agitated while so doing, until the wax very slowly sinks. It is now ready. Take a portion of the foundation to be examined, and knead it into a ball of the same size as the first piece, taking great care that no air becomes embedded ; drop this into the bottle ; if it sinks in the same manner as the first piece put in, it is pure ; but if it floats, it is not, as its specific gravity is lighter than pure wax. You must wait, before testing, until both pieces are of the same temperature. Another and more satisfactory method is by testing its melting-point ; this is performed by the following means : Having procured a thermometer that will register 200° Fahr., get a canned salmon or lobster tin, and remove both top and bottom ; make some holes round the edge ; in



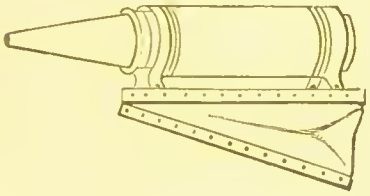
Appliance for Testing Spurious Wax.

this tin place a small lamp. Next obtain an empty condensed milk tin, and half fill it with water; light the lamp, and place this on top. Now melt a small portion of the wax to be tested, and draw it into a capillary tube (a small glass tube, which can be obtained at any instrument maker's for a nominal sum); when cool, stop up each end, and tie it to the bulb of the thermometer; place them in the water, and wait until it registers about 135° Fahr., then watch the capillary tube. The very instant the wax turns transparent, and darkens, note what the thermometer registers, as that will be the melting-point. If pure, it ought not to register lower than 146° Fahr.; you must not be particular to one degree with such rough appliances.

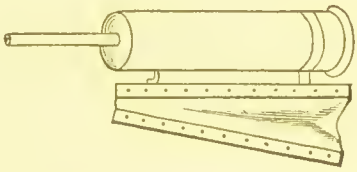
There are several makes or patterns of foundation, namely: Stock, super, natural base, flat-bottom, drone-size, and thick-wall. With the exception of flat-bottom, the septum or mid-rib of all is exactly the same shape as the bees naturally fashion their cells, but the flat-bottom, being simply a sheet of wax having the shape (hexagonal) of the edges of the comb-cells slightly raised on its surface, the septum is perfectly flat, *i.e.*, quite unnatural. This latter make *appears* much thinner than the "natural base." The makers claim that the bees thin it out more perfectly than they do the "natural base." This is not so. The foundation looks better for sale; that is the only advantage, and a very questionable one to the bee-keeper. Super foundation is made of better-coloured wax, also thinner, than stock, as it is used only in the sectional supers, while stock is kept entirely for the body-box and shallow frame supers. The foundation we advise for use is the "natural base," both for the body-box and the supers. Sectional supers should be fitted up with thinner foundation, that is, super foundation, which on no account should be made of white wax (usually adulterated), but of yellow, with plenty of honey-like aroma to it. When held up to the light it should be very clear; if it has a granular appearance, after warming, there is almost sure to be an adulterant present. Foundation over twelve months old is exceedingly brittle and hard. This can easily be remedied by thoroughly warming it either before a fire, or, better, by immersing it in water heated to a temperature of from 100deg. to 105deg. Fahr.

54. Subjugators.—To beginners well knowing the natural irritability of these insects, the most astonishing part of modern bee-keeping is the ease with which an expert handles his charges; removing combs from the hives covered with bees, taking up handfuls from skeps with bare hands, causing them to perform an exodus from their hive into an empty one placed near. It would be of no use trying thus to get the bees under command unless means had been devised for reducing them into a state of subjection. In order to accomplish this, the bees must be frightened. Now, to frighten or intimidate a bee requires a different course of procedure to the ordinary method of subjugating

members of the animal kingdom. It was discovered that, when smoke was blown into a hive, the bees were thrown into a state of great commotion, and with evident trepidation commenced filling their honey sacs from the open cells; in this condition of demoralisation and surfeit they were comparatively harmless. When this discovery was made we know not; but, no doubt, it was centuries ago, as the natives of Central Africa, who live on the banks of the Congo, and are great bee-keepers, use smoke when they take the surplus honey (Johnstone). The natives of India do the same. This being so, an appliance was introduced called a "smoker," which consists of a tin cylinder mounted on, and connected with, a bellows; the cylinder, on being filled with fuel, such as cotton, rotten wood, or brown paper, was lit, and by means of the bellows kept alight, at the same time sending forth a volume of smoke from the nozzle. The great difficulty to contend with was the fact of its "going out," perhaps just as the apiarist was in the middle of some manipulation, and required its services. To leave the bees while he re-lit the smoker, meant their endeavouring to subjugate him, instead of him them; again, after a smoker has been used a short time, a nasty black fluid runs from it, and will, unless great care is taken, soil the combs, hives, or sections. It has to be frequently filled with fuel, and is very cumbersome. There is also the danger of setting fire to the hives or combs, which is not infrequently done. Knowing these disadvantages we devised another appliance, called a "fumigator," although this is scarcely a correct term to apply to an instrument in connection with which no fire is used or smoke produced.



The Smoker.



Webster's Fumigator.

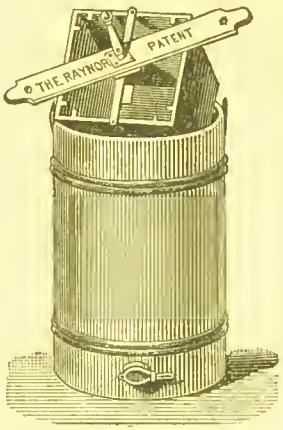
This is a zinc cylinder mounted upon, and in direct communication with, a bellows. At one end of this cylinder is an inverted cone, from the lowest part of which a nozzle protrudes; covering over the hole at the back of this nozzle is a shield, to prevent anything but air or vapour being blown through; the other end of this cylinder has a cover, the inside of which is furnished with four hooks holding a piece of sponge. The sponge is saturated with carbolic acid, creasote, and water. At the back of this sponge, a piece of carbonate (the common hard, or crystal form) of ammonia is placed; when so prepared, the fumigator is ready for use, and will last, according to the amount of work, for weeks

or months, without any further trouble. It is more effective than a smoker, without any of its trouble or mess.

55. Webster's Subjugator.—This is a liquid which is sprinkled upon pieces of washed calico, and kept in an ordinary ¼lb. mustard tin to conserve the odour. In use, a piece of this scented calico is laid upon the tops of the frames for a few seconds, or until the bees are thrown into a state of commotion, which can be known by their loud buzzing; it is then removed, and the colony manipulated. Any return of organisation can be thwarted by applying the calico again.

55*. Apifuge.—This is a liquid used for scenting the hands, and, to some extent, prevents the bees from stinging them.

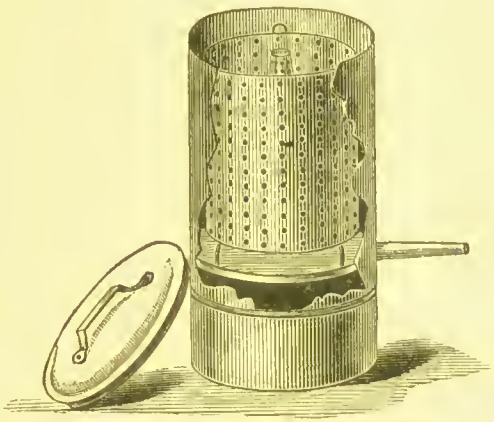
56. Honey Extractors.—These are appliances used for the purpose of extracting the honey from the combs without any injury that would impair their future utility in being re-filled by the bees with honey. A tin cylinder, having a treacle valve at the bottom, is furnished with a rod, or pivot, having one end fitted in a centre at the bottom, and the other carried in a cross-bar, which is screwed on the top of the same. A square cage is fitted upon this rod, having very thin, woven wire, this wire being prevented from bulging by strips of tin placed edgeways against it, acting as battens. The combs, after being uncapped—the cell coverings removed—are placed in this cage, it accommodating two, when, by rapidly turning the handle connected with the cage, the contents (honey) of the comb are thrown out into the cylinder by the centrifugal motion imparted thereto. There is another make of extractor, called the "Little Wonder," in which the comb-holder is fitted on a long rod, to which the necessary rotary motion is given by the hand, one end of the rod, or spindle, being fixed in the ground by a spike, and the other grasped by the hand. This is not of much service, especially as cylinder extractors can be purchased for a very little more money. The best cylinder extractor is one invented by Mr. Raynor, and bearing his name.



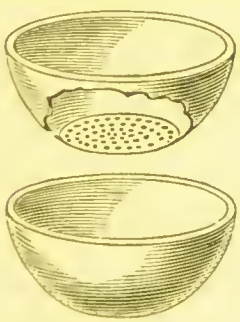
The Raynor Honey Extractor.

57. Wax Extractors.—The trouble and inconvenience experienced by bee-keepers in the separation of wax from the dross contained in the combs, brought forth the inventive genius of a Swiss gentleman named Gerster, who produced an appliance called the "Gerster Wax Extractor." This is, almost

in its original form, the wax extractor of to-day. By the old-fashioned method, all dark comb had to be melted separately from the light, as the process of boiling dyed the wax with the dross ; but by using the wax extractor, we obtain an almost uniform colour, no matter whether clean or dirty combs are placed in it for extraction. The engraving will give a clear idea as to its principles. A boiler like a saucepan is surmounted with a tin cylinder, at the bottom of which is a stationary dish, connected with the outside by a spout ; resting upon short legs in this dish is a perforated zinc or tin basket, having a tube of the same material in the centre ; a lid covers all. The comb is placed in this basket, and the boiler about half filled with water ; upon the whole being placed on a brisk fire the steam surrounds the basket and also passes up the tube, thus thoroughly heating the combs ; the wax in them melts, and percolating through the basket falls into the dish below, and thence runs out of the spout into some receptacle placed under to catch it. In this receptacle some hot water is placed ; any little dirt that may run out with the wax settles at the bottom, and is easily removed when cold. This is rather an expensive appliance, and only suitable to those making some considerable quantity of wax. A cheaper extractor, the invention of Mr. Redshaw, was some two years ago introduced ; it is formed of two tin basins, fitting one in the other, the upper one having a perforated zinc bottom ; the whole is placed in the oven, water being in the underneath one ; the wax melts, and runs through the bottom of the top basin, and is caught by the underneath one. This can be purchased for 2s. 3d. Another, called the "Killick Wax Extractor," is very similar in its method of working to the above one, but will not hold more than sufficient comb at one melting—which takes about three-quarters of an hour—to produce 6oz. or 8oz. of wax. Both these are very suitable for a small apiary of from one to four hives

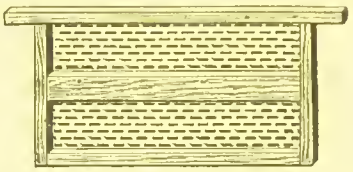


Improved Gerster Wax Extractor.



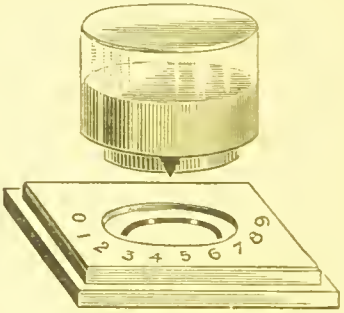
Redshaw's Wax Extractor.

58. Queen and Drone-excluder.—This is sheet zinc perforated with oblong holes of a size that workers can pass through, but not large enough for queens or drones—in fact, a bee sieve. It is rapidly getting into disfavour, as it is found very materially to impede the workers' passage into the sections or supers. The object of using it is that the queen may not deposit her eggs in the supers. Where very large supers (non-sectional) are used, or where back-supering is practised, it is imperative that it should be used. In the first place, if a queen should happen to ascend into a large super (non-sectional) it is spoilt, but in a section-rack the section or sections spoilt can be easily removed and the portion visited by the queen cut out, the section being then returned again to the hive to be repaired. Our advice is not to use it under sections. Where it is obliged to be used, always place it with the burr side turned towards the entrance; the holes being punched, there is, in consequence, a burr on one side, which acts as a trap for any bees dying in the super if the zinc is not placed on properly, the removal of them being prevented by their articulations catching in this burr.



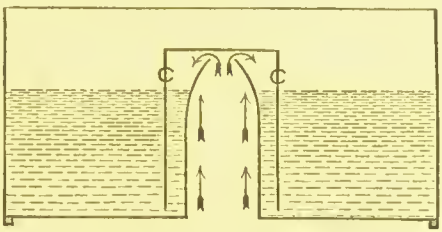
Queen-excluder for Body-box.

59. Feeders.—There are so many descriptions of bee-feeders now before the bee-keeping public, that a description of all would be a task of some magnitude; we will, therefore, choose two which have been found to be all that can be desired. First is the regulating bottle-feeder. This should be in the hands of every bee-keeper, as by its means a hive can be fed as slowly and almost as quickly as desired. It consists of a stage, made in two parts, having a hole about 2½in. in diameter in each; between these a zinc diaphragm is placed, having a slot cut half way round, and corresponding with several small holes in a metal cap covering the mouth of an inverted bottle; attached to this cap is an index. The stage is numbered from 0 to 9. When it is desired to feed slowly, this index is pointed at No. 1; this allows only one of the holes in the metal cap to be exposed; by turning it to No. 9, nine holes are uncovered; or by shifting it to 0, feeding is stopped. With this feeder it is impossible for the bees to be able to sting you. When it is desired—as in the case of condemned bees placed



Regulating Bottle-feeder.

upon empty combs—to feed them very quickly, a different feeder is used. It is a wood box with a lid. The box should be coated with wax (cheap paraffin wax will do); the diagram will fully explain its construction. The bees, upon the box being placed over a hole in the quilt, pass up in the direction of the arrows, and obtain the syrup as quickly as they deem fit; they are prevented from getting into the box, and so drowning, by the cover (C, C).



Sectional View of Fast Feeder.

60. Veils.—It is advisable for all bee-keepers to wear veils, not only on account of the unpleasantness of being stung in a tender part of the face, but also to prevent the bees crawling over it while both hands are engaged; the titillation produced by this will often cause a sudden movement to be made, which irritates the bees. We have sometimes had them persist in crawling backwards and forwards over the eyes; this is not at all conducive to a calm demeanour in manipulating, which is a *sine quâ non*. The best veils are those with wire fronts, as this prevents the veil being blown against the face—a bee usually chooses this place to sting. For ordinary use, a veil made of black net, with a band of elastic run in at one end, by which it is fitted round the crown of a hat, will be found sufficient. The loose end should be carefully tucked inside the collar of the coat, to prevent the bees getting inside. All veils, whether they be wire or net, should be black, as the light being reflected from white net prevents a clear vision.

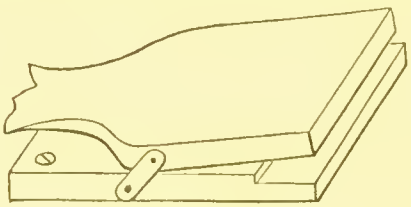
61. Gloves.—These should never be worn, but the wrists of the coat should be fastened with an indiarubber band, to prevent the bees exploring up them, which they are sure to do. Where gloves are worn, two pairs of wool, wetted, having gauntlets on the outside pair, will be found very effectual; kid or single leather gloves are of no use. A glove has been manufactured of lambskin, the fleece being left on. This very effectually prevents the stings puncturing the leather; but all are a nuisance, on account of the clumsiness it occasions when manipulating, and so irritation of the bees. The best gloves are those made of indiarubber, although rather expensive and very perishable. They are made of a sort of macintosh material, although we have seen some made from pure rubber. American cloth has been used for making bee-gloves; but as we have heard little of them, they no doubt do not answer.

62. Dresses for Ladies.—These are an absolute necessity. A thin muslin or calico bag is made, having two holes, with elastic bands, the feet to pass through the holes, and the bands to fix round the ankles, the outside edge being looped up outside the dress or petticoats.

63. Wire-embedder.—This little instrument is one of the most useful that has been invented during the last two or three years. It is used for the purpose of embedding wire into foundation, particulars of which will be found further on. Being the invention of a Swiss gentleman named Woiblet, it is called "The Woiblet Spur Embedder." Every apiarist should have one.

Woiblet Spur Embedder.

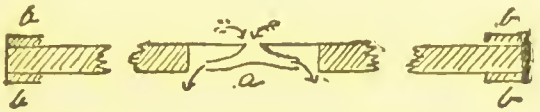
64. Foundation Fixer.—There are two or three on the market; but we have always found that the handle of a table knife does the work as quickly and, with a little practice, as well. The illustration below represents one of the best. The section is placed, together with the wax "starter," between the jaws, the slot in lower one acting as a gauge, that the foundation may be fixed exactly in the centre; the jaws are squeezed together by raising the end of the upper one, the lower being screwed to a table, the foundation being mashed into the wood by a draw-back motion of the handle of the machine, allowed for by the peculiar hinges at the sides; the "starter"—*i.e.*, the little triangular piece of foundation—is then turned at right angles to the section with the fingers.



Foundation Fixer.

65. Frame Stands.—It is quite a bother sometimes in the apiary to know where to temporarily rest a frame of comb and bees after removal from a hive; especially so is it when your hives are not made larger than will hold the necessary number of them. If you rest it on the grass, by the side of the hive, quite a number of the bees are left on the ground—maybe the queen. It will, therefore, be found very handy to have a frame stand, which can be made by any novice in carpentering; in fact, a box of the exact width of the hive will do nicely, and will also be useful for carrying combs from the hives into the house when extracting, if provided with a lid. A comb stand is sold to hang on the side of the hive, but it has the same disadvantage as resting by the side of same—the queen is apt to drop on the ground.

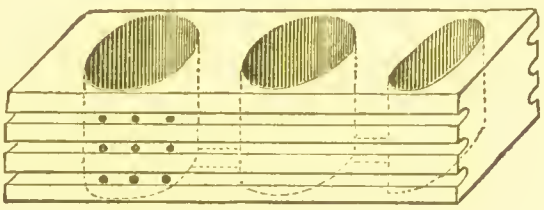
66. Super-Clearer.—This appliance is one of the most important helps to the apiarist. We had the honour some four years ago of introducing it to the bee-keepers of this country, and at the present day it can be found in use in every well-ordered apiary. It consists of a flat board the same size as the bottom of a super; upon each side is a bee-space (*b b b b* in the annexed illustration), and in the centre is a trap formed of wire gauze (*a*),



Section View of Webster's Super-Clearer.
a, Wire Cloth Tubular Escape; *bb*, Bee Spaces.

which allows the bees to pass through one way, but effectually prevents their returning. When it is desired to remove a super, the "clearer" is quietly slipped underneath it, and allowed to remain in this position for from six to twelve hours; at the expiration of this time the super will be found quite clear of bees, and thus can be removed without the remotest chance of the manipulator getting a sting.

67. Travelling Cages.—Bee-keeping, at the present time, has assumed such extensive proportions, that whereas, a few years ago, no one thought of sending bees any distance by rail or otherwise, now they are sent hundreds and even thousands of miles. Hives of bees have been sent to Australia, India—in fact, all over the habitable globe. We will give a description of the cage used for queens. An oblong block of soft wood 3½in. by 1¼in. by ⅞in. is procured; into this are bored, almost through, two holes with a ⅞in. centre-bit, at the extremity two smaller ones are made contiguous to each other; the division thus formed is cut away with a sharp knife, this forms a long narrow hole across the end of the block. At the bottom of each division between these three holes a tunnel is cut, thus connecting all three together. In the narrow hole food is placed and covered over by a piece of thin wax to prevent its evaporating. This food is made by mixing finely powdered loaf sugar with honey until it is about the consistency of putty. It is



Travelling Box for Queen.

called "Good Candy." Along each side of this block three longitudinal grooves are made, and in these grooves, at each side of the hole furthest away from the food, six small holes are bored through in to this hole for the purpose of ventilation. A thin wood lid covers all. When a queen and about half-a-dozen workers are placed in they can obtain a varying temperature according to the changes outside; thus, if the weather is cold, they can cluster in the hole without the ventilators, or, on the contrary, can go into the one with plenty of ventilation, the food being placed nearest the warm chamber is easy of access in each instance. Queens thus packed will live a very considerable time without injury; we have one now that has been in the box a fortnight. Swarms are best packed in a box having large holes at least 6in. square (larger if the box is very crowded), on each side, covered with perforated zinc. Driven bees must be packed in the same description of cages as swarms.

68. Frame Ends.—At one time the varieties of these were legion, but at the present time no end can bear comparison in any way with that known as the "W.B.C." This is an end made of sheet tin, stamped and folded by machinery. Though answering the purposes, in the most effective manner, for which a metal end is so necessary, yet, owing to the ingenious way in which it is manufactured, it weighs less than if the ends of the frames were made of wood.

69. Bee-Houses.—These are generally very awkward contrivances and a great nuisance. No doubt if a very considerable expenditure was made, a bee-house could be built with advantage to the bee-keeper, and also to the bees; but unless a house is made of sufficient height and size for the bee-keeper to stand upright and have plenty of elbow-room in, it had better be left undone. Much better to have your hives in the open, where they can be manipulated with ease and comfort.

VIII.—FOOD.

It will be found very essential, at certain times and seasons, to feed the bees with artificial foods, a description of which and recipes for making are therefore of great importance. Any sugar food that may be burnt must on no account be given to the bees.

70. Syrup.—Sugar is provided in this form to the bees that it may be used directly as a substitute for honey, and will be found equally as valuable to them. During autumn the syrup to be fed must be of a much thicker consistency than at any other time; the reason for this is that by giving it to

them in a more condensed form, less evaporation is necessary, it having to be brought to a certain consistency before the bees will seal it over. They will also labour under considerable disadvantage in doing so at this season, the temperature being much lower than at the time of honey gathering, so that, in order to keep up the necessary warmth, their physical capabilities are impaired, which at this time ought to be of the strongest that they may survive the rigours of the winter.

71. Recipe for Syrup in Autumn.—Take 5lb. of the best loaf or granulated sugar, and place it in a preserving pan; add to this 2½ pints of water, put the pan upon the fire, and stir. As soon as the sugar is quite dissolved, the syrup is done. No boiling is required, as this frequently causes the syrup to crystalise.

72. Recipe for Syrup in Spring.—To every pound of loaf or granulated sugar add ¾ pint of water, and treat as above.

Both the above syrups can also be made by pouring boiling water upon the sugar and stirring until dissolved.

73. Medicated Syrup and Candy.—Procure some naphthol beta (β Naphthol) from the chemist, dissolve this in spirits of wine (about a tablespoonful to a scruple is sufficient) by agitating it in a bottle. While the syrup is still hot, stir the solution in at the rate of 1 drachm naphthol beta (apothecaries' weight) to 20lb. of sugar. Candy is medicated in the same manner and in the same proportion.

74. Dry Sugar.—This is sometimes used in place of candy. Porto Rico is the description to use.

75. Candy.—The present make of candy, quite different from the barley sugar sort of old, has almost supplemented dry-sugar feeding. This food, if carefully made as we describe in every particular, will be found to be a very fine-grained mass of sugar, far superior to raw sugar, and one upon which the bees will feed ravenously. When cold it must be so soft as to be readily scraped with the finger-nail, and if a piece is placed in the mouth it should dissolve almost instantly; these conditions must be arrived at if it is to be of the greatest service to the apiarist and his bees. The recipe is as follows: Put into a preserving-pan of either copper or enamel ware (copper is better) 10lb. of granulated sugar and a teaspoonful of cream of tartar, and upon this pour 1¾ pints of cold water; put the pan upon a brisk fire and stir occasionally to prevent burning. When the sugar commences to froth up, watch that it does not froth over the sides of the pan: if there is a likelihood of its doing so, remove it from the fire for a few seconds, then replace it. Presently it will

commence to boil violently with a crackling sort of noise but will cease to froth up. Keep it thus boiling for exactly three minutes, then remove it from the fire. Now procure a bath of sufficient size to accommodate the preserving-pan within it; into this put sufficient cold water so that when the pan with its boiling contents is put into the water, the latter will not overflow into the sugar. Having put the pan into the cold water, leave it thus while you place some pieces of clean white paper on some plates or dishes upon which to run the candy into cakes. Return to the hot sugar and with a spatula quickly stir it. Continue to do this without intermission until it commences to change colour from transparent to cloudiness, which gradually increases, until the whole mass assumes the appearance of very thick gruel; then pour it into the plates. It will be sufficiently cool to give to the bees in about half an hour. *Flour candy* is simply made by stirring into the above candy when hot half of a 1d. packet of pea-flour to every 5lb. of sugar.

76. Artificial Pollen.—Artificial pollen is flour made from peas, wheat, or rye; preference is given to pea-flour.

77. Water.—This is a very important food to be provided for the bees, especially in spring. It is placed in vessels so formed that the bees can drink without any danger of drowning. Pieces of cork form convenient floats for the bees to stand on. A small quantity of salt sprinkled in is of great benefit, and ought not to be neglected.

IX.—SWARMING.

78. Natural Swarming.—Swarming is the bee's natural mode of procedure for the reproduction of colonies. At a certain season of the year, usually from May to July, the hive having become too crowded, the queen lays drone eggs. When a number of these have been produced, the bees commence forming a variable number of queen cells; most frequently when the first of these is sealed over, the weather being propitious, the major portion of the population, together with the old queen, issue forth from the hive, and, after circling in the air for some time, settle in a compact mass upon some adjacent position, usually on the branch or branches of some low tree or bush; this mass of bees is called a swarm. After remaining in this position for an uncertain period, they, if not secured by the bee-keeper, fly to another place, perhaps some miles away, and there, if a suitable place is found, construct combs, gather honey, rear brood, and go through the same routine as has been before done in the original community; when they have so furnished their home they are called a stock. This description of swarming is

very troublesome to the bee-keeper, not only as to its uncertainty as to the time it will take place, but also as to the position they will occupy when they have settled, perhaps in a most inaccesible place; the swarm by such proceedings being frequently lost. Again, where a few colonies only are kept, it does not answer the bee-keeper's purpose to watch, or employ some one to do so, for the exodus of a swarm; and yet, by neglecting to do so, the swarm may be lost. Natural swarming being of such an uncertain character, modern bee-keepers devised a method whereby the bees were made to give a swarm just at their pleasure or convenience; this is called artificial swarming.

79. Artificial Swarming.—One of the simplest methods to form an artificial swarm from skeps is thus conducted. The bee-keeper is supposed, for example, to be the owner of two skeps, both of which—this is imperative—are in a condition for natural swarming, or at least one is, and the other well crowded with bees. On a fine, warm, and bright mid-day, the skep which we shall call No. 1 is driven (see "Driving," par. 90); when nearly all the bees and the queen have left No. 1, and gone into the empty skep, which will be called No. 3, No. 3 is placed in the original position occupied by No. 1. The other skep, which until now has not been interfered with, will be called No. 2; this must now be placed on a stand some little distance away, and No. 1 put in No. 2's original position. After a time, all the bees that were flying from No. 1 at the time of driving will have joined the cluster in No. 3; this is the swarm. The combs and brood of No. 1 having been placed on the stand of No. 2, all the bees that were flying from No. 2 at the time of moving it will return to No. 1, it being in the position only known as their home to such bees; they will rear the brood, and also another queen. No. 2 will have thus given a portion of its population to No. 1. It is upon these lines, with slight variation, that artificial swarming is usually conducted. It is far preferable to natural swarming, inasmuch as no risk is run of losing the swarm, there is very little likelihood of a second swarm, and the bees are kept continually at work, which is a very important gain, as frequently, when allowed to swarm naturally, much time is wasted before all the conditions are exactly suitable for swarming. During this time of waiting very little work is done, the greater portion of the colony hanging outside the hive in a huge cluster, idling their time away. By these means a swarm can be obtained for sale, or otherwise, just on the very day the bee-keeper requires it. Swarming from bar-frame hives is conducted much on the same principle, but it is managed with greater ease and certainty. By many it is called "dividing," and no doubt that is the most correct term to use

80. Dividing one Colony, in a Bar-frame Hive, into Two.—If one colony is wished to be divided, we go to the hive and shift it to another position, not less than two yards away, then place a fresh hive in the position vacated by this stock. Next remove three frames of brood bees and queen from the stock into the empty hive, and fill up with three frames of foundation, alternating them with the full combs; also replace the frames removed from stock with fresh ones of foundation or empty combs. If a fertile queen can be given to this stock, much time and honey will be saved.

81. Dividing Two Colonies into Three. — Remove half the number of frames of brood from one hive (No. 1), but brush or shake the bees back into it; then place these combs in a fresh hive (No. 3). Now remove another strong stock (No. 2) to a fresh stand, and place the new hive (No. 3) in the position vacated by No. 2. Thus No. 1 provides brood; No. 2, bees; and No. 3 receives the bees flying from No. 2, and will rear a fresh queen, and hatch the brood given to it. A queen can be given to No. 3 in about seven or eight hours (see "Queen Introduction"). The hive (No. 1) from which the frames were removed, must have them replaced with sheets of foundation, and No. 3 must have three sheets given them, to be increased gradually to the full complement as the first ones placed in are gradually drawn out. Empty combs are much better than sheets of foundation.

82. Forming a Colony from an Indefinite Number of Others.—Remove a frame with queen and bees from a colony, and a frame, without bees, from each of the other colonies until the required number (six or seven) is obtained; then place this fresh hive in the position occupied by a very strong stock.

All these manipulations must be performed on a very fine day when the bees are flying freely, between 10 a.m. and 5 p.m., not after or before such times, and during the swarming season; the hives must also be thickly populated. Unless all these conditions are observed, failure is certain.

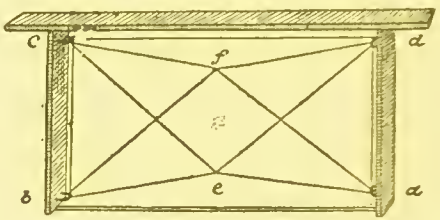
83. Hiving Natural Swarm. — When the bees have clustered in a compact mass on a branch, a perfectly clean skep should be held under them; then shake the whole mass into it, and turn it right way up upon the ground. For a few seconds all is quiet, then a loud hum is heard as the bees run up into the dome-shaped roof. It is the best plan to place the floor-board of the hive upon the ground, and turn the skep upon this. If the queen has not been shaken in with the cluster, they will, in a few minutes, vacate the hive and join the queen in the position occupied by her. If the queen is inside the skep, the bees outside will gradually converge towards it, and quickly

enter. By these motions of the bees will a knowledge of the position of the queen be obtained. As soon as the bees have settled down quietly, which will be in about from ten to twenty minutes, the hive and its contents should be removed to the position it is permanently to occupy. Bees do not always cluster in such convenient places as the outstretched branch of a tree, and often the ingenuity of the bee-keeper is severely tested, in order to devise some means of obtaining possession of them. The middle of a quickset hedge is a favourite position ; they can be dislodged from here by placing on top of the hedge, and directly over the cluster, a clean skep ; then dip some large feathers (goose wing) or sticks in a weak solution of carbolic acid, and drive them up into the skep by placing the feathers or sticks close to the bottom of the swarm, moving them continually to it as the bees ascend, until they are lodged safely within. If the queen can be seen to enter the skep, no further trouble need be taken ; the hive can be placed on the ground near, when, in a short time, all the remaining portion of the cluster will join those in the skep. Their movements can be accelerated by shaking the bushes about, dislodging as many of the bees as possible, and so causing them to take wing. Swarms can always be gradually shifted from their positions by manipulating with feathers or sticks dipped in carbolic acid solution, or with a fumigator; the first-named are the handiest for the above purpose. There is no occasion to anoint the inside of the skep with any mixture of sugar, beer, &c., as is frequently done, with the idea of enticing them to stay ; it is simply old-fashioned folly to do so, it makes not the slightest difference, but only gives the bees the trouble of removing it again.

84. Preparing Bar Frame Hive for Reception of Swarm.—Having hived the swarm in some clean receptacle—it is not imperative to use a skep—and taken them to the position they are permanently to occupy, leave them there until about an hour before sunset, and start preparing the bar-frame hive for their reception. We will take it that the hive is one made upon much the same principle as those illustrated at the commencement of this work, the floor-board being quite separate, and removable from the body box, for convenience in putting swarms in, and also for cleanliness. Six frames must be arranged as described below, and then placed in their proper positions in the hive; their shoulders must come close together. Now bring the dummy board right up close to the frames, and place the quilts on. You will do well to have a good piece of American cloth (with little or no smell) next the frames, with the enamel side downwards, and then two or three thicknesses of very warm material—such as felt—on top. A regulating bottle feeder must also be put in position on the hive. The hive is then ready for the reception of the swarm.

85. Fixing Foundation.—You will require sheets of foundation equal to the number of frames you wish to fit up, some thin wire (No. 30 tinned), a spur embedder, a board exactly fitting the inside of the frame, and just a shade under half the thickness of the width of the bars of the frame, having two ledgers as in illustration. Now take the frame and drive four three-quarter-inch wire nails at *a*, *b*, *c*, *d*, and turn up the points inside the frame as hooks; then measure off two and a half yards of the wire, and make a small loop at one end; put this loop over hook *a*, then put the wire over hook *b*, to *c*, to *d*, back to *c*, under at *e* to *d*, to *a*, over at *f*, to *b*, and fasten off. The wire must be pulled tight at each turn during the fixing. Now place upon the board a full sheet of foundation, lay the frame upon this with the wires pressing close down upon it, make the embedder hot over a lamp—not red hot—then wheel it along each wire, using a little pressure. This will embed the wires right into the septum, or midrib of the foundation. On lifting the frame from the board, the foundation will be found to be firmly fixed into the frame, and it will be worked out by the bees without sagging or buckling in the least. A sheet of paper should be put between the foundation and the board while doing this; it will prevent its sticking and so tearing upon removal.

Appliance for keeping Frames in Position for Wiring.



Method of Wiring Frame.

86. Placing a Swarm in a Bar-frame Hive.—At the time advised, procure a flat board quite as wide as the hive and about the same length; if the hive is on a stand it will be necessary to have a box, or another stand, the same height as that of the hive. Now put the swarm in the skep on one side for a time, and place the frame hive in the position vacated by the skep. It is of very great importance that the hive should stand perfectly level; therefore, with a spirit level and a long straight-edge, adjust the hive correctly each way. If it is out of the perpedicular, all the combs being built by the bees plumb with the earth, they will be irregularly formed, thus, in many cases, entirely nullifying the advantages of the bar-frame system. When the levelling has been completed, raise

the front of the body-box up about an inch from the floor-board, propping it in that position by means of two stones or pieces of wood. Now rest one edge of the square board upon the alighting-board, and bring the opposite edge about level with it; this then will form a table in front, and extending to the entrance of the hive. Get your subjugating cloths near at hand, as occasionally these are wanted, and a stiff feather from a goose wing. Everything being now ready, gently lift the skep and with a very slight rolling sort of jerk precipitate a handful or so of the bees upon the table; push these near to the entrance with the feather, and they will commence to run in. When you see this jerk some more of the bees among them, and when these are all busily engaged running in precipitate the whole by jerking the skep violently between the hands; those running in will give the signal to the remainder that a suitable home has been found. The latter, nothing loth, rush in as fast as possible like a flock of sheep, each giving the signal to the others until quite a loud, contented sort of hum is set up by all. Sometimes a few will endeavour to run over the edge of the board and congregate underneath: any attempt of this kind must be at once stopped by putting a subjugating cloth in their way, when they will instantly run from it. When running bees into any receptacle, it is as well to bear in mind that they always make for the darkest part, that is the reason why they run into the hive, it being quite dark within. Sometimes even the shadow of the apiarist falling upon the board will cause them to run in its direction. This is the easiest and cleanest method of populating a frame hive, and proves the advantage of having body-boxes separate from the floor-board and stand. If the floor-board is a fixture, or is simply removable from body-box and stand, the two latter being fixtures, a different course must be pursued, as the bees cannot be run in at an ordinary entrance. The hive must be uncovered, the frames spaced wide apart, and the bees thrown down upon the tops of the frames, then driven down between with the fumigator. Often, in doing this, they "boil over" the sides of the hive, when, in such cases, many are lost, and sometimes the queen; if she is lost from a swarm, they will gradually dwindle away and perish. When driven down, place the quilts on, to prevent their ascending into the roof. After some time, the frames must be brought close together, and the quilts re-arranged, the dummy-board being pushed close up against the last frame. All this occasions a vast amount of trouble as compared to the former method. Where a bar-frame hive is of sufficient capacity to hold, say, sixteen frames, the bees can be put in very easily, by drawing the dummy-board close to the back, and placing the six frames in front, with the quilts on them; then throw the bees in between the last frame and the dummy-board, and prevent them ascending the sides with the subjugating cloths; they will, in a very short time, run

in and cluster among the frames. The dummy-board can then be shifted right up to the last frame, and all covered up snugly.

87. After-treatment of Swarms. — Directly a swarm is put in a hive, it should be fed with syrup, of the strength recommended for spring feeding. To do this, cut holes through the quilts in the form of the letter C; thus you will have a piece of the quilt to form a shutter when not feeding. The different thicknesses of quilting should each have this shutter to open in different directions, or the feeder will not stand level. Keep the bottle continually replenished. Feeding is of very great importance, especially with early swarms. When the bees have been in the hive about a week, examine them, to see whether all the foundation has been drawn out into combs; if they have, place two more frames of foundation in the hive, alternating them with built combs. Keep on feeding, and, in about three days, see that these last two sheets are drawn out; if so, add two more in the same manner, or as soon as they are finished; they will then have their full complement of combs. When these are finished, feeding can be stopped—if the honey flow is on—and the section racks put on. If there is little honey coming in, keep feeding slowly—that is, allow about two holes of the feeder to be uncovered.

88. Prevention of Absconding Swarms.—When a first swarm issues from a hive, it usually settles somewhere very near the apiary; but in the case of second swarms, or casts, they will frequently fly some distance before settling. The reason is obvious: a first swarm is accompanied by the old, and a cast by the young, queen; the latter, being frequently unfertilised, is more agile than the former, taking longer flights. When a swarm does not seem inclined to settle water should be thrown over it, in the form of a spray from a syringe or garden engine. This, if skilfully applied, will have the desired effect. Sand thrown among them will sometimes cause them to settle; but the old style of beating a "tom-tom" on pots, frying pans, and kettles is but a little amusement to the beater—it has no effect whatever on the bees. Often, on placing a swarm in a hive, it will issue again; the reasons of these erratic movements are often a mystery. If this occurs, re-hive the bees, and place a frame of brood, some of which should not have been capped over, in the middle. This offers a great inducement for them to stay as they have a considerable amount of affection for the nurselings of the hive. Where such a frame is not obtainable, enlarge the hive and shut the bees in, with perforated zinc over the entrance; then remove them to a cool, perfectly dark place —such as a cellar—for twenty-four hours. They will then, upon being returned to their stand and allowed to fly, settle

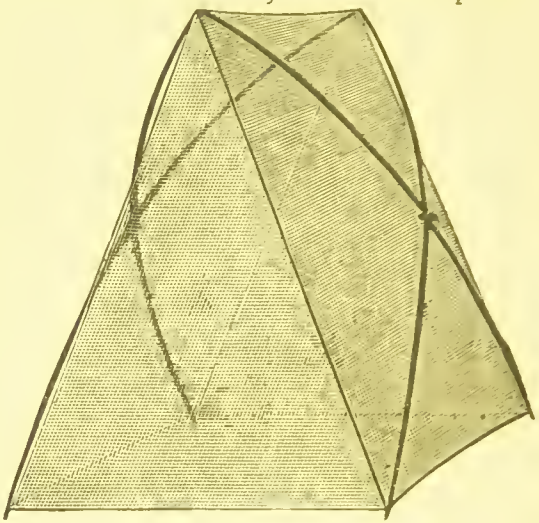
down quietly. When a swarm is first placed in a skep, the latter should always be allowed to stand in the shade until the bees have settled, and then at once moved on to its stand, keeping it well shaded from the sun.

X.—MANIPULATING.

89. Quieting and Handling Bees.—Confidence, in a great measure, is the bee-keeper's safeguard; skill, perhaps, ranks as second in importance; and while the appliances used in quieting the bees only take a third position, yet we cannot do without them. For particulars of these appliances we refer the reader to par. 54. Various conditions have to be borne in mind when handling bees. A hive in the middle of the day, when honey is coming in plentifully, is in its most amiable mood, and requires very little, if any, intimidating; the same hive on a cool evening will hardly allow even a corner of the quilt to be turned up without resenting it. A hive having no stores, or all stores sealed over, is exceedingly difficult to handle. A queenless colony is usually more vicious than one in a normal condition. During autumn on a hot day, it is unwise to make any very extensive manipulation, and all such should be performed towards evening. A full colony is more difficult to handle than a weak one. If a colony is once raised to the pitch of stinging in earnest, cover it up and go to it on a future occasion. Many colonies which are not to be subdued by smoke or carbolic acid will frequently be as tame as flies if well sprinkled with warm syrup before handling. An incautious jarring of the hive will often raise a colony to the extreme of viciousness. In commencing to subjugate, walk as gently as possible to the hive and raise the roof without a sound, place it somewhere near, then gently raise one end of the quilt and *peel* it back with one hand while you drive the bees down between the combs with fumigator or smoker; do not puff in the entrance; as soon as the bees are busily engaged filling themselves with honey—this can easily be seen by their poking their heads in the cells—do what is required quickly and gently, but quietly; never make any swift or sudden movement, and on no account allow your breath to enter the hive. Do not allow, upon removing a frame, any portion of it to knock against the hive. Never lift out a frame until you have shifted it laterally sufficient to clear the adjoining ones; nothing irritates the bees more than being rubbed between two combs. Never crush a bee: the smell of the poison in its body irritates the others. If a bee stings you, do not flinch if you can help it, but scrape the sting out with the nozzle of the fumigator—the smell of this counteracts that of the sting: the quick movement of a flinch will cause others to try their stings upon you. Always

wear a veil, but not gloves, as they make you very clumsy, and so irritate the bees. When intimidating bees with subjugating cloths—the easiest and readiest method—do not lay the cloths about in the sun, but when not required place them in the tin box; the sun will remove the effects of the subjugator if exposed to its rays for any length of time. It is advisable to occasionally wash the cloths in plain water (the subjugator will act as soap); after drying they can again be sprinkled, and are then as effective as fresh ones. These cloths are used dry, so that the honey is never contaminated with the odour as with carbolic acid cloths.

In spring, before the honey flow sets in, or in autumn, after the honey flow has ceased, bees become very troublesome when a hive is opened; the attractions of a honey feast thus exposed are irresistible to the occupants of the neighbouring hives, who will at such times make a perfect onslaught on the exposed colony, a free fight, as well as plenty of stings to the apiarist, being the result. To obviate this, a tent was introduced by A. J. Root, of Ohio, which is of sufficient size to cover colony and manipulator right over when it is imperative that a hive should be opened at such times, which very effectually prevents the intrusion of strange bees into the opened hive. This tent is made to fold up into a very portable package for convenience when not in use. It is made by taking four sticks of some tough wood, such as ash, about 8½ft. long, and fastening them together like two letter X's, with a screw just where they cross. A piece of strong, fine cord, makes the ridge, and the same cord unites the sticks at the tops. A mosquito-net bag is made, having the same description of cord along its lower four edges, and down each of the four corners; this is slipped over the sticks and secured at the bottom corners by loops or rings, sewn on to this bag, and slipped over screwheads at bottom of sticks. When thus looped tightly, they bow the sticks, which should be scraped thinner at this point, at the top, to allow of room for the operator.



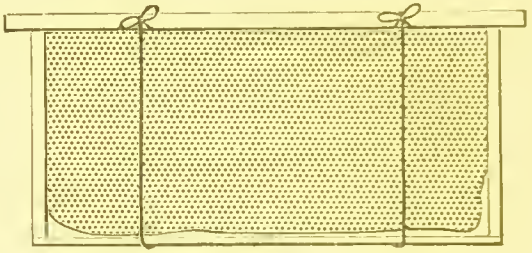
Root's Manipulating Tent.

90. Driving.—By "driving" is meant the act of causing the bees to vacate their skep, leaving combs and brood, and entering another skep or other receptacle. Before commencing provide yourself with the following articles: A table, a fumigator or smoker, subjugating cloths, two iron staples, a short skewer, a veil, and an empty skep. Having thus prepared yourself, put on the veil, go to the skep to be driven and blow about a dozen or so puffs with the fumigator right into the entrance—pushing the nozzle well in—directly stopping it up with a tuft of grass placed in lengthways, not screwed up anyhow; then tap the outside of the skep a few times all round with your open hands—this is more especially required on a cool day; directly you hear a considerable hum, it is time to leave off. Now withdraw the grass, and give five or six more puffs, after which allow the bees a couple of minutes' rest in order that they may fill themselves with honey. During this time you must prevent any bees from coming out by means of the fumigator or subjugating cloths. Then gently turn the skep upside down, driving the bees between the combs as you do it; place it upon the table in this inverted position. If it is a flat-topped skep, it will stand without any support; but if of a dome shape, it must be put in a pail to steady it. Now take the empty skep, and push the skewer through its extreme edge, from inside to outside; then place it nearly mouth down upon the stock, and push the pointed end of the skewer into the top edge of the lower skep—this forms a hinge. Lift the top skep up in front, and insert the two staples on the outside, so as to fix it in the position as seen in the engraving. Be particular that the combs run from back to front, and not across the opening thus made, or you will have some trouble to make the bees ascend. Then drive the bees down from the front and two sides, as you want the bees to run up the back part. So arrange your skeps that the strongest light comes from your back. Now commence with the palms of your two hands to give regular, slow, and continuous taps, so as to jar the combs, but not hard enough to break them; presently the bees will get into a violent commotion, and will commence to run up the back part of the skep into the top one. Some will endeavour to "boil over" the sides; these must be driven down. After a short time, the stock skep will be emptied of its bees; then the top one with the bees in it can be removed. In driving with a smoker the same course is pursued; but the entrance must not be stopped. The easiest plan to subjugate the bees in a

Position of Skeps when Driving.

skep is to stand behind it and then drop a subjugating cloth over the entrance as a curtain, the two top corners being held between the two thumbs and the side of the skep, and the hands pressing on the latter. Loosen the skep from its stand and turn it upside down, the top coming towards you; this will cause the cloth to fall right over the mouth of the skep and so prevent any escape of bees, at the same time effectively subjugating them.

91. Transferring.—As the term denotes, this applies to the removal of a stock, with combs and brood, from one hive and placing them in another; but in bee-keeping it only applies to such a proceeding when practised between skeps or boxes and bar-frame hives. If we take a stock and combs from one bar-frame hive and put them in another, although it is transferring, it would not come under that denomination from a bee-keeper's point of view. This manipulation is frequently performed if the stock has nice straight and fairly new combs; but, on the other hand, one having old, dark, and crooked combs is not worth the trouble. It is, to a novice, the easiest method to transfer three weeks after swarming, as then there is usually no capped brood in the hive—consequently, no likelihood of damage being done to it. We will suppose that you have a stock with quite straight combs, and the skep is at least 11in. high. The appliances needed will be two penny bundles of the narrowest tape procurable, a board of a size rather larger than a bar-frame, a pair of scissors, and a sharp table-knife. Now commence by driving the stock as described under the heading "Driving" (par. 90), and, when finished, place the bees on one side. Take the skep containing the combs, and cut it in halves between the two centre combs: this allows them to be taken out with much ease, although it destroys the skep. A knife is sold, having a hooked blade, that can be used to cut the combs out without destroying the skep; but cutting it in halves is much the easiest plan. Now place the board upon a table and lay two pieces of tape, each 25in. long, across this board; then take one of the combs from the skep, lay it flat upon the tapes, and then put one of the frames of the bar-frame hive upon it, marking the exact size of the inside of the frame upon the comb; remove the frame and cut the comb as marked. Now place the frame about the comb, and, bringing the two ends of each tape together, tie the comb into the frame.



Method of Securing Comb in Frame.

If the comb is not deep enough to reach the bottom bar of frame, a slat of wood must be placed along the bottom edge of it, and the tapes passed under that instead of the bottom bar. The frame with the comb tied in, as illustrated, is to be placed in the bar-frame hive, and every comb in the skep of sufficient size treated in the same manner. Reject all drone-comb.

A comb can be made up of pieces of others, if they are nicely fitted in and well secured with tapes. The whole of the combs having now been utilised, the bees are to be put in the hive in the same manner as described at par. 86 ("Placing a Swarm in a Bar-frame Hive")—that is, if the transferring is done quickly; but if but slow progress is made, after having transferred a couple of frames, a quantity of the bees must be shaken in and the quilts put on; this is done that the brood or eggs may not get chilled, a frame being added from time to time as finished. The combs must be placed in the same position as they occupied in the hive—that is, honey at top, brood at bottom—and all brood must be crowded in the centre of the hive.

92. Transferring with Old and Crooked Combs.—Place the frame hive in the exact position as occupied by the skep, and fit up all the frames with sheets of foundation. Then drive the bees, and, after the queen has been seen to go up into the upper hive, stop driving. Lay a sheet of excluder zinc upon the tops of the frames, completely covering the space occupied by them; then put the skep upon the top of the excluder zinc, and stop up all means of ingress from the lower portion of the frame hive into the upper, around the outside of the skep. Now run the bees, with queen, into the lower portion, or body-box; the queen, with a portion of the bees, will keep in there, the bees drawing out the foundation. Some of them will stay in the skep and rear the brood. The excluder zinc preventing the queen going up and laying any more eggs in the skep, all brood will be hatched out in three weeks, when the skep can be removed, the bees driven out and returned in at the entrance to body-box, the excluder zinc removed, and quilts placed on, the honey being taken out of skep, and combs melted. Another plan is by making an artificial swarm (par. 79), and placing that in the frame hive; in three weeks drive the skep from which the swarm was taken, and remove the queen, uniting the bees to the frame hive. It is better to remove the old queen, which will be the one in the frame hive. The skep must be gradually brought close up to the frame hive before the uniting takes place, or a number of the bees will be lost.

93. After-treatment of Transferred Colonies.—When a colony has been transferred as advised, it should be fed plentifully until the combs have been firmly fixed in the frames, the broken portions mended, and all spaces filled up with new

comb. In from three to four days remove the tapes; this can easily be done by cutting them on the tops of the frames with a pair of scissors, and then drawing them out. If any of them have been fastened by the bees, it cannot be done thus; the frame will have to be taken out and tapes removed. These tapes, if left in the hive, will be gradually removed by the bees; but it is very injudicious to leave them in, as a number of the bees will be engaged for days in gnawing them to pieces for removal, and will also get entangled in the fibres. Sheets of foundation must be added gradually to make up the full number of combs; but this need not be done if the transfer has been made late in the season; then well feed the stock up on six frames. Never transfer a stock after the middle of August.

94. Uniting.—It is very frequently of great service to unite two or more colonies, as, by so doing, the harvest is very considerably increased, and many other advantages gained. It is a well-known fact that two weak colonies will never collect any surplus; but unite them, and so form one strong colony, and a good return will almost invariably be obtained. In winter, if a small cluster only of bees is left in a hive, they stand very little chance of living through its rigours. When so small a quantity are thus situated, a large amount of stores must be consumed to keep up the required heat; but unite two such lots, making one strong colony, less heat is required, and, as a consequence, less food is consumed. A queenless colony can be united to one having a queen, when spare queens are not procurable, as in early spring. In all cases of uniting, the hives must be gradually brought close together, if they are in the same apiary, or less than a mile apart. Driven or condemned bees can be united, in order to form strong colonies, in bar-frame hives; such are usually very successful. Swarms may be united by shaking them together, if this is done within twenty-four hours of swarming. In the matter of uniting, it is a hard-and-fast rule that any two colonies, both being deprived of their hives, combs, and brood, will unite peaceably if thrown together and mixed, the two queens, unless one is removed, fighting it out for supremacy.

95. Uniting Two Colonies in Bar-frame Hives.—First move the two colonies close together, by gradual stages of not more than a yard per day (see par. 108). Having brought them quite close together, obtain about half-a-pint of thin syrup—1lb. of granulated sugar to a pint of water—and mix in it eight drops of essence of peppermint—not oil of peppermint; this latter caution is given, as we saw a colony ruined by using the oil instead of the essence, the former being much too strong for the purpose. When this is prepared, go to the hives, and, after subjugating the bees, well sprinkle them with this scented syrup. This

plan can also be modified by well dusting each lot with ordinary flour. After about three minutes have elapsed, space the frames of one colony wide apart ; this had better be done with the hive that the queen is to be removed from. After she has been removed, take the frames from the other hive and alternate them with the frames of the first one, being particular that all combs with brood are placed close together, in the centre. As all the bees smell alike, no fighting will take place. Presuming that there are too many frames in both hives for the capacity of one, keep out any not having brood in them, brushing the bees off with a stiff feather back into the hive. Those who are at all timid of bees had better put all the frames in the hive, and, early the next morning, if cold, remove the outside frames ; they will have no bees upon them, the cold night causing them to cluster closely over the brood in the centre of the hive. Some of the frames without brood, if too many for the body-box, can be rested on top of the others, but over the quilts, until the next day ; all the bees will join those below if a passageway is left for them. Two colonies, one being queenless, can be united in the same manner. In the hands of an adept the scented syrup need not be used, as, in the event of fighting commencing, or any signs of it, it can be prevented by shaking the bees well up together, which a novice would hardly care about doing. Even when the frames are simply alternated, fighting rarely takes place, but in autumn or spring the queen is likely to be "balled"—*i.e.*, killed by suffocation—the bees forming a compact mass around her about the size of a walnut.

96. Uniting a Skep with a Bar-frame Hive.—Drive the skep, then subjugate the colony in the frame hive, and remove the least valuable of the two queens. Then take out the frames from the bar-frame hive, and shake off all the bees on to a board placed in front and contiguous to the entrance of the hive; then shake all the driven bees from the skep among them—they will get thoroughly mixed, and run in together at the entrance quite peaceably (see par. 86). Scented syrup need not be used in doing this, as both colonies have been for a short time deprived of the hive, combs, and brood.

97. Uniting Nucleus Colonies.—At the end of the season there are frequently a few nuclei without queens ; these can all be united to one nucleus colony having a queen by alternating the frames of each in a fresh hive, first dusting them with flour.

98. Uniting Swarms.—Throw the two swarms together upon a sheet or large board, and let them run in a hive together. This must be done within twenty-four hours of swarming. Casts, or second swarms, can be treated in this manner ; they will then pay, if fed up well. Swarms will frequently unite of their

own accord if they issue at the same time from hives contiguous to each other.

99. Difficulty in Uniting Two Distinct Varieties.—Two distinct varieties of bees do not unite so easily as two of the same race. This is most noticeable with Italians; it is much the best plan to use scented syrup with these.

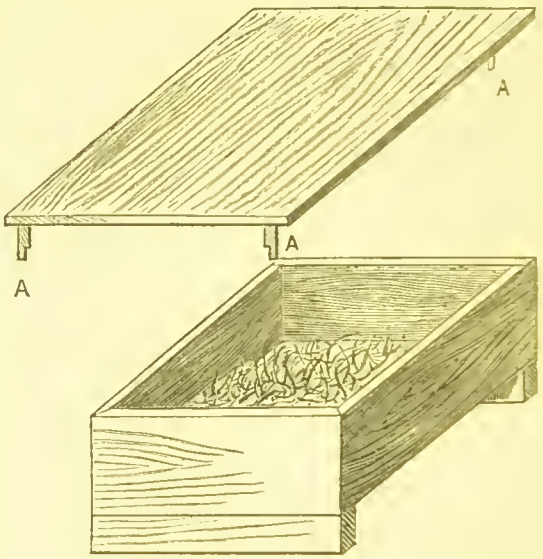
100. Feeding.—When to feed, and how to feed, are questions of very great importance to the bee-keeper. By feeding at an inopportune time much damage is done; by not feeding, the same results will most likely accrue. There are two most important seasons when feeding must be done; they are, Spring and Autumn. Both these descriptions of feeding are totally different in their mode of application, and also the description of food supplied. We will therefore enumerate the various systems in their proper order as the bee-keeper will be called upon to practise them.

101. Spring Feeding.—A hive at the commencement of spring is in a very depopulated condition; especially is this the case when, through an excess of stores the previous autumn, the queen has been restricted in her breeding space. Under these circumstances there will be very few bees left in the hive when spring arrives. The oldest bees of a community die first; as a consequence, the young ones are the most likely to live through the winter and come out in the spring in the best condition. If the number of these can be augmented by young ones reared earlier in the spring than they would be in the natural course of things a great gain will be made. Not only is this done, but a hive can, by judicious feeding, be brought into such a condition before the honey flow as it would be, if left unattended, after such had commenced. It is well known that bees, if left entirely to their own inclinations, are not in so flourishing a condition when the honey flow sets in as they are a short time after—therefore much honey is left to waste, as there are not sufficient bees to collect it; but if we can, by a certain system of management, get our hives in as strong a condition just before this event takes place, this early honey will be saved to the bee-keeper. It is also of a quality far superior to that gathered very late in the season, excepting heather honey. At about six weeks before the expected honey flow the graduated bottle-feeder is placed in its position upon the top of the frames, but over the quilts, a hole being cut through these to enable the bees to get to the under part of the feeder and so obtain the syrup. The bottle is filled with sugar syrup of the consistency as directed under the heading "Spring Syrup" (par. 72). If the whole number of holes were uncovered, so as to enable the bees to get an unlimited supply

of the food, they would so fill their combs that the queen would be "crowded out"—the meaning of which is that the cells would be filled with syrup until there were none, or very few, empty ones left for her to lay eggs in; the colony must then gradually dwindle away. But, on the contrary, if the amount of syrup fed to the bees is restricted to suit the ideas of the advanced bee-keeper, a great advantage will be gained; therefore, unless the colony is in a starving condition, the bees must only be allowed to obtain the syrup through not more than two holes of the feeder, and if they take down more than a half-pint of syrup per day, this must be reduced to one hole. The manner in which this so favourably affects the colony is thus explained: Unless an amount of stores is being collected by the bees sufficient for their consumption as well as for the larvæ, the queen will not lay eggs much beyond the number that can be supported upon that quantity. If no stores are coming in, but there is a sufficiency in the hive to support the colony, the queen will lay a moderate number of eggs—in fact, will breed in a half-hearted sort of manner—but the instant stores begin to come in her laying is greatly increased; hence by practising this mild deception upon the queen, causing her to suppose that natural stores are being collected, she increases the number of eggs laid, and the colony by this increases proportionately in strength. In some cases a stock is so well supplied with natural stores that it is unwise to feed even the small amount from one hole in a feeder, as we must allow the queen as much space as possible for her to lay in. When such is the case, the cells contiguous to the brood-nest containing honey must be uncapped. This can easily be done without removing any of the frames—which is inadvisable in early spring—by simply inserting an ordinary table-knife between the frames and raising the cappings of a few cells every two or three days. This will very much increase breeding in the hive, and by many is thought superior to feeding; but our colonies are not always in so flourishing a condition as to admit of this being done. Often colonies at springtime—about February or March—are found to be short of stores, especially when the winter has been mild, causing the bees to move about, and in consequence to feed more freely. If at this early time syrup is given them, it will most likely produce dysentery; this must be avoided by giving them candy or dry sugar. In the recipe for making candy (par. 75), we have advised running it while in a soft state upon sheets of paper; these slabs of candy must be broken up into pieces of about 3in. square, and laid with their unpapered side downwards upon the tops of the frames, the quilts being covered over and tucked down snug and warm. The object of having the paper is that, as the candy is eaten away, the paper forms an archway through which the bees can pass from one

frame to another without having to go into the cold atmosphere at the lower part of the hive. Flour candy can be given them with advantage at this season of the year.

102. Dry Sugar Feeding.—This is another system of feeding in very early spring (but feeding with soft candy is preferable). It is conducted in the following manner: A thin piece of paper, having about a dozen holes made with a pencil being pushed through just over the position where the bees cluster, is laid on top of the frames, first removing the quilts. On this paper three or four pounds of Porto Rico sugar is laid and pressed down firmly; it will then form almost a solid cake. Upon this the quilts are laid, an enamel one first, with its bright side down. The condensation of the moisture from the bees will soften the sugar, which has the peculiar property of taking up moisture more readily than any other description, and so forms syrup, the bees using it as fast as produced. This sugar can also be fed to them in a feeder at the back of the hive; but in cold weather this often fails, as the bees have to leave the cluster to get at the food. The feeder used for this purpose is a double dummy-board, having one wall removable. The space between the two walls is filled with sugar. The inner wall does not quite reach the top bar; this allows a space for the bees to enter at the top and feed. There is a little more waste by feeding on top of the frames, but it is much the safest plan.



Inexpensive Pollen-feeder.

103. Artificial Pollen.—This must be given the bees, directly crocuses blossom, in boxes distributed in sunny corners near the hives. Straw should be first chopped up in lengths of 2in. or 3in., and laid on the bottoms of the boxes, the flour (par. 76) being thickly sprinkled on this. A roof must be provided, to prevent any rain driving in, or the flour will cake; the boxes must also be raised from the ground, that dampness may not similarly affect the flour. The illustration makes this clear; A, A, A are the roof supports to allow bee-space.

104. Summer Feeding.—Feeding in the summer months is very seldom resorted to, except with swarms. These ought always to have an abundance provided directly they are placed in the hive, the feeding to be continued for about a fortnight. The syrup used should be of the same consistency as that advised for spring feeding. There are times in the summer months when, perhaps, feeding will be found advantageous; but it should never be resorted to unless the bees are unable to do without it. Of course, when so feeding them, the sections (if on the hive) must be removed, or they will become the receptacles of the syrup. Under these circumstances we strongly deprecate the feeding of stocks in summer.

105. Autumn Feeding.—This is the most important time of feeding, and it should receive the bee-keeper's best attention. It is almost entirely owing to the care bestowed upon this whether the stocks live or die during the rigour of winter. Autumn feeding should on no account be continued later than the 1st of October; prior to this date all feeding should have been done and finished. Every stock before then must have received its quota of stores. This is of great importance, the success of our harvest the next season depending, in a great measure, upon it. If a colony is fed upon syrup after the above date, the bees will be unable to evaporate and seal it over in the combs, on account of the lowness of temperature. Bees cannot manipulate their wax in a temperature lower than 85° Fahr. The temperature in a cluster when comb-building will be found to be not less than 90° Fahr. As such is the case, the wax at a lower degree is not sufficiently plastic for them to form cappings to their cells; the syrup is thus exposed to the air, and as a consequence it will ferment and turn sour, producing dysentery in the bees that feed on it. Where the honey-flow ceases at the end of July, or beginning of August, autumn feeding should be commenced soon after, but only in those colonies that are very short of stores, and even with these by very slow degrees, or the queen will be "crowded out"; but as soon as the advent of September the feeding must be as fast as possible. The syrup to be used is that recommended under the heading "Autumn Syrup" (par. 71). When a colony in a bar-frame hive has 30lb. of stores feeding can be stopped, as this amount is sufficient to last them until the following spring. A very good calculation can be made as to the weight of food in a hive by taking, as a basis, the weight of one frame when filled, and of the average thickness. An Association Standard frame, if fairly new—say not more than three years old—will contain about 5lb. of stores. If the total amount is reckoned upon this assumption, a very correct estimate can be made, which will always be on the right side, as a comb three parts filled will represent a trifle over

three-fourths of a full comb, as the upper—just where the honey is stored—holds more than the lower portion. Where autumn feeding has been neglected, candy can be placed upon the tops of the frames, or Porto Rico sugar, as recommended in "Early Spring Feeding" (pars. 101 and 102). On no account must syrup be fed to bees during the winter. All feeding is preferably conducted on the top of the hive, and the feeders well covered to prevent any bees gaining access to them. The feeder described on p. 37, a sectional view of which is there given, is a very good one for feeding up quickly in autumn; and where such quick feeding is imperative, as in driven bees or neglected stocks, a feeder upon this principle must be used. A large stock can be very easily fed up in a little over a week with this feeder. Many apiarists cause one or two colonies to store a sufficiency of combs for a larger number of stocks, removing such combs as fast as filled, and giving them to the other colonies in want. In the case of colonies being over full of stores, frames may be taken from them and given to needy stocks, thus saving the trouble of feeding, which at the best is a source of much trouble and labour.

106. Feeding Nuclei.—Nucleus hives should always contain a fair proportion of stores, which should be given them in frames—that is, at least one frame in the hive should be well filled with honey, some of which must be uncapped.

107. Winter Feeding.—The necessity for this only occurs when a bee-keeper has neglected his stocks. Warm cakes of candy should be quickly and quietly slipped under the quilts on a warm day, taking the greatest care that the least amount of cold air enters the hive while doing so.

108. Moving Bees. — The difficulty of moving hives of bees a short distance without its entailing a considerable loss to the population is very great. When a bee first flies from the hive it takes note of all the surroundings, continually flying from the hive in gradually increasing circles and returning again, until it has become quite familiar with the exact position of its home. If that home is moved the bees, not being aware of such removal, when they again fly forth will return after to the only position known to them. There being no hive there, they will, after searching around the spot for a considerable time, perish, unless they are allowed to enter a neighbouring hive, which they will be permitted to do if filled with honey, and thereafter form part of that colony; but the major portion of such lost bees settle upon some adjacent object and die. The surrounding country is so well known to the inhabitants of a hive that, if it is moved two miles away, quite a number will find their way back to the original position and die, but

not in such numbers as to be of much detriment to the stock, as most of these *voyageurs* are old bees who have pretty nearly "run their course." As will be seen by this, it is inadvisable to alter the position of any hive unless it is moved at least two miles. But this does not apply to the winter time, after the bees have been confined to their hive for some weeks. During this period they seem partially to have forgotten the topography of the neighbourhood, but not entirely so, as even then a few will fly back to the old stand. Therefore, if it is required to move hives a short distance, one of the following plans must be adopted: it must be done during the winter, and after a considerable interval of bad weather; or they must be taken at least two miles from their original position, and then, after about a fortnight, brought back to the position required; or the hives must be moved towards a given spot, by short stages at one time. If a colony is moved two yards from its position it is found that a large number of the bees will be lost; but if the distance moved is only one yard, all will be able to discover the whereabouts of the hive. Particular attention must be paid that the moving is only done on the evening of each day when the bees, through this same day, have been flying very freely. The position of two hives can be interchanged—a course of action frequently desirable if this is done when honey is coming in plentifully. Bees coming home laden with honey will almost invariably be received into a strange hive, as also will very young bees. This strange fact accounts for so many bees of distinct and different races being found in other than their own hives.

109. Spring Management.—As soon as winter becomes a thing of the past the bees will commence to move in a more business-like manner; not but what, even before this, they have been preparing for the coming season. Brood-rearing has been going on for some time; very often in January a commencement will be made, and nearly all hives contain a certain amount of brood, in various stages, during February. It is then but a small patch, right in the centre of the cluster, which, as the season advances, gradually increases in size until nearly the whole of the combs in the body-box are one mass of brood. When breeding has started the bees must be kept particularly warm; more so is this necessary than even in winter. It is by the warmth of the bees' bodies that the eggs are hatched, and the larvæ protected from the cold. A sudden chill will kill them. The greatest care must be taken that no cold draughts are allowed to enter the hive, and that the coverings on top of the frames are sufficient and well packed. Many careless bee-keepers place the quilts on, but do not notice whether they properly cover the frames or not, so

that frequently there will be quite a current of cold air through the hive.

See that all colonies are well supplied with food, and, if any are found short, feed with slabs of candy on top of the frames.

Examine all colonies some warm day in March, to see that none are queenless; if so, they must be united at once to another stock having a queen (see "Uniting," par. 94). Remove all frames not occupied by bees, and close up the division-board nice and snug.

All floor-boards should be cleansed from the *débris* which has collected through the winter. In the crevices of the floor-boards, and at the junction of them with body-box, are favourite retreats of the larvæ of the wax-moth: these must be killed. To remove the floor-board, lift up the body-box very gently, and place it close alongside upon a slightly carbolised cloth; then scrape and brush the floor-board at some distance from the hive, thus preventing any of the wax-moth larvæ gaining access to it again; then replace it in its proper position, with the body-box in its place. The bees have now a clean hive to commence the work of the season in, as no dirt is ever allowed to remain inside the body-box, and the bee-keeper has removed the dirt from the floor-board.

Soon after the commencement of April will be the best time to commence stimulative (Spring) feeding; but in certain districts, where early honey-producing flowers blossom, a commencement can be made before this time. In locations near fruit plantations and orchards, bees are in a strong condition much earlier than where the first honey crop is from the clovers. This well exemplifies the fact that early or stimulative feeding produces forward colonies. Where a stock has plenty of stores, it can be stimulated by uncapping a portion of the honey cells (see "Spring Feeding," par. 101).

At this season add frames of comb or foundation to the outside of the brood-nest, where the hives have been contracted, but not until warm weather sets in, or if the hive gets uncomfortably crowded; and then only add one at a time, until the full complement of frames occupy the body-box. Ten Association Standard frames will be found the most convenient size for a brood-nest; very few queens occupy a larger number.

Robbing is very prevalent in spring before the honey-flow sets in, but is never so difficult to eradicate as in autumn. Keep the entrances of hives contracted according to the strength of the colonies, or their aptitude for protecting their hives.

Artificial pollen must be supplied to the bees just before crocuses blossom, unless there are considerable sources for the supply of the natural in the neighbourhood, such as from the willows, furze, whin, crocuses, and other early flowers (see pars. 76 and 103).

The providing of water at this season is very important; this

should be given in shallow dishes, filled with pieces of brick for the bees to alight on, and placed in some warm corner. Do not allow any miniature pools between the pieces of brick, or quite a number of bees will be drowned.

Stocks can be equalised at this season by removing frames of brood from very strong hives and giving them to weaker ones ; but this may only be done when warm weather sets in ; and the colony added to must have all its combs thickly covered with bees. It will take about six weeks to build up a colony to its required strength ; this time must be allowed from the commencement of stimulative feeding until the usual time of the honey-flow in a certain district.

This will be found a very convenient time to repaint and repair any hives in use. The frames should be lifted *en bloc*, if it is at all cold, into a fresh hive, and the old one taken into the workshop. During spring will be found the great advantage of having the alighting-boards of hives to reach the ground ; thousands of bees are saved by thus preventing their being blown, by the strong and cold winds prevalent then, under the hives to perish. During spring hives should be fitted up ready for swarms, section-racks cleaned and re-filled ; and all little matters of detail which can be done during the slack months will be found of great assistance when the busy season arrives. Purchases of appliances required in the summer months should be made, as when the latter season arrives orders are sent in for goods in such numbers, and all wanted "at once," that the manufacturers cannot execute them fast enough, many of their customers having to wait a week or two before the receipt of goods.

110. Spreading Brood.—Some writers advocate what is termed "spreading brood" in springtime; this is, we venture to assert, the worst advice that can possibly be given. The brood-nest of a hive is almost a sphere, which shape is always preserved, so that if a portion of the middle of it (a frame) is exchanged with one on the outside of the brood-nest, an irregularity is made. This not being countenanced in the hive, eggs are laid by the queen to preserve the circular form ; as a consequence, she thus enlarges the brood-nest considerably. The bees in the hive are thus distributed over a wider area, quantities of brood being chilled—more than the number gained by spreading. Even an expert cannot prognosticate the temperature that may occur at any particular time, and if that suddenly drops the cluster of bees will contract, and leave quantities of brood uncovered, to become chilled. Not only is it the loss of eggs and larvæ, but, without doubt, the decomposition of the bodies in the cells must be a fertile source of disease ; then, again, all the dead larvæ have to be removed by the bees, whose

time might be occupied in a more profitable manner. We should desire to see this manipulation banished entirely from the pages of all bee manuals.

111. Autumn Management.—Directly after the honey-flow ceases, the bees will commence to rob where they have the opportunity ; any weak colony will be a desirable object for their attention, therefore preventive measures should be taken (see "Robbing," par 117) to stop this inveterate habit of the bee.

All colonies should be thoroughly examined to see that there are none queenless ; when any are so found, a queen must be introduced (see "Queen Introduction," pars 124, 125).

Any supers which have been allowed to remain on the hives must be removed, as the honey contained therein will be taken down into the body of the hive as soon as cool nights set in. Should there be any partially filled sections, these can either be extracted or placed behind the division-board—which must be raised up ¼in. from the floor-board—for the bees to clear out.

From the beginning until the end of August the queen should be kept breeding ; this cannot be if the combs in the centre of the hive are full of honey ; extract three or four frames, and place them in the middle of the brood-nest, removing some of the outside ones to make room for them. The young bees hatched at this season will be of great benefit to the hive in early spring. Supersede all old or worthless queens.

Drive bees from cottagers' skeps, and unite them to any hives that have become depopulated. Strong colonies always winter better than weak ones. Second and third swarms—usually weak—should be united to form strong colonies, and then fed up. The youngest or most desirable queen in all cases should be kept.

As soon as September arrives, feed up all colonies as quickly as possible (see "Autumn Feeding," par. 105). When this has been done, prepare them for the coming winter. Each comb should have a winter passage cut through it ; this is a hole about ¾in. in diameter. Cut by means of a pointed knife, thrust through at about two-thirds the height of the comb, when, by giving the knife a twist, a circular hole is made. These holes enable the bees to alter their position from comb to comb without passing through the cold atmosphere at bottom of hive. A better plan—one that does not disfigure the combs—is to place narrow pieces of wood, about ⅝in. thick, here and there on top of the frames ; when the quilts are laid over these they form tunnels for the bees to pass over the tops of the combs. Many bee-keepers reduce the number of frames in the body-box for the bees to winter upon ; where combs are wanted for other purposes, this can be done, but if not wanted leave them in the hive. We have failed to discover any advantage by removal.

Provide thick cushions for covering over the quilts ; these can be made of calico and filled with chaff; but the best description, as well as the most convenient, is a shallow box, without top or bottom, of a size to cover the number of frames in the hive ; on the bottom of this tack loosely a piece of calico. This tray is to be laid over the quilts, and filled with cork dust, obtainable at any fruiterer's, it being used for packing foreign grapes in. Place American cloth quilts next the frames, with the glazed side down ; these are, without doubt, the best quilts to use at all seasons, but they must be thickly covered over on top, and the colonies must be strong—both necessaries in successful wintering.

The entrances to the hives should be kept open to the extent of about six or eight inches in the case of strong colonies, and covered with excluder zinc, loosely tacked on, in order to prevent the entrance of mice.

Roofs of hives should be thoroughly examined before winter, and mended where found defective ; dampness is a source of many of the evils attendant upon bee life.

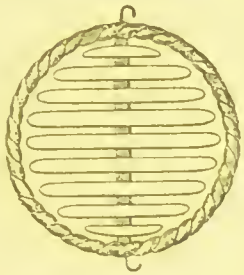
It is during autumn that the greatest difficulty is experienced in handling bees ; extra precautions must be then taken, not only on account of the bees' increased pugnacity, but to prevent the access of strange bees into the hive when manipulating. Where possible, all manipulations should take place after the bees have ceased flying, or before they have commenced. Frequent failures to intimidate a colony are experienced at this season, mostly from the fact that all their stores are sealed over ; in consequence, the bees are prevented from filling themselves with honey. This is obviated by taking a little can of warm syrup to the hive, and pouring a small quantity between the combs ; it is greedily licked up by the bees, and is a very effectual substitute for uncapped stores. It is at such times as these that the superiority of subjugating cloths over smoke as an intimidant is fully seen. Not only is it possible to intimidate a hive, but also at the same time prevent the ingress of strange bees when the manipulations have to be performed while the bees are flying. On such occasions provide two pieces of washed calico, 17in. broad and about 19in. long ; these, after being charged with the subjugator, as before recommended (see page 50), fold up into two rolls, 17in. long ; remove the quilts from the hive, using the fumigator to drive the bees down ; then nearly unroll one of the cloths on top of the frames, covering them right over, the now unrolled portion to be at the back of the hive. When the bees are sufficiently occupied—two or three minutes—in their honey cells, the dummy-board and first frame must be shifted to the back of the hive, and the frame examined, the other rolled-up cloth to be placed lengthways on top of these ; now roll up the first cloth so as to uncover one frame, examine

it, shift it to the back of the hive, and unroll a portion of the second cloth on top of it; you thus have only one frame uncovered at a time, and only a very small quantity of bees to contend with, as the rest are being kept in a state of subjection all the time by the subjugating cloths. The bees flying will have little to do with the hive while these cloths remain on.

112. Packing for Travelling.—The bee-keeping industry has made such rapid strides during the last few years, that bees have become quite frequent articles of commerce; this being so, many railway and other journeys must be made by them, when often, through the fault of inexperienced people, accidents occur which under a different method of packing would have been averted. If greater care is not taken in the packing of bees for railway journeys, the railway companies will, as in some parts of America, refuse to carry them. We give directions how to pack bees for travelling in safety in the United Kingdom. For foreign countries the packing is too difficult for novices. We have, however, sent full colonies with perfect safety to Natal, Cape Colony, and Australia.

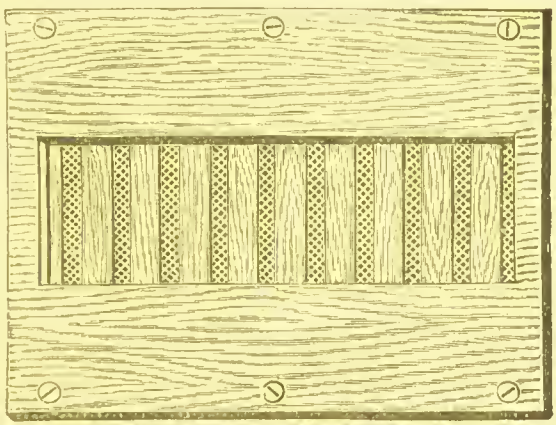
113. To Pack a Straw Skep.—These should never be sent on a railway journey between the middle of June and the end of October, as the combs being laden with honey, the temperature high, and the hives crammed with bees at such season, the whole structure will give way, and the bees be drowned in their own honey. Swarms of the current year in straw skeps must not be moved until December at the earliest, or certain destruction will ensue, the combs being so very tender. It is much the best plan to defer any railway journey during frost or very cold weather. A straw skep, if not laden with honey, and at least a twelvemonth old, can be so packed as to travel any distance. The following is the best plan of packing for a long journey: Provide a number of pieces of cork—wine corks cut up will do nicely—⅝in. thick (each having a hole bored or burnt through the centre), a piece of stout wire three inches longer than the skep is wide, and pointed at one end, three-quarters of a yard of strainer-cloth, and some string; place these articles handy and close to the hive to be packed. Now intimidate the bees as before directed when Driving, and then invert the skep in a pail to keep it steady: now take one of the pieces of cork, and placing it between the middle top edge of the first comb and the inside of the skep, push the pointed end of the wire through the skep from the outside through the cork and comb; then place another piece of cork between this first comb and the next, and push the wire through this piece of cork and comb; and so on until the whole of the combs have a piece of cork between each two, the wire skewering them all solidly together: this keeps the combs from swaying and consequent breaking. Turn the wire at each end

on the outside of each side of the skep where it protrudes; now replace the skep on its stand to collect the flying bees; when they have returned and quieted down, spread the strainer-cloth upon the ground, lift the hive mouth down upon this, and gathering up the four corners of the cloth, tie it round the skep securely with string. After the bees are thus fastened in, the hive can be inverted and two more strings fastened round separately, four small wire staples being driven in over these strings to prevent their slipping up or down. The hive has now only to be placed in a hamper in its inverted position, labelled "Live Bees—With Care" in large letters, and then sent off to its destination. Where a hamper is not obtainable get the top of an American cheese box, and coil a straw band within this, then set the hive on this band and cord it tightly on; the straw acts as a cushion, preventing violent jarring. In packing straw skeps for travelling short distances, where no changing of trains takes place, the corks and wire can be dispensed with, but they must always be sent in an inverted position, with the mouth of the skep covered either with strainer-cloth or perforated zinc.



Method of Securing Combs.

114. To Pack a Bar-frame Hive for Travelling.—This will require a little more attention than a straw skep, but usually bears the journey much better. The articles used in the packing will be a number of pieces of the narrowest tape procurable, each 25in. long, and a board 17in. wide and as long as will cover the entire number of frames and the dummy-board in the hive. In this board an oblong hole is made, at least 4in. wide, and of the greatest length that the board will allow; over this hole a piece of perforated zinc is affixed. A few long screws and a narrow strip of perforated zinc, of a size to cover over the entrance to the hive, are also



Flat Board Covering Frames.

required. Go to the hive to be packed and remove each frame, tying them round with two pieces of tape in the exact manner as advised under "Transferring" (par. 91), returning each to the hive as finished. Now lay upon the tops of the frames the board with the oblong hole, the side where the zinc is tacked on being uppermost; then tightly screw this board down on the tops of the frames, so that it presses them firmly down: it will then hold them perfectly rigid. The hole provides ventilation, which is very essential when the bees are excited with the journey. When this is done, cover the board with the quilts and leave the bees alone until they have settled down quietly; when they have, tack the narrow strip of perforated zinc over the entrance. They will now be firmly fastened in the hive. The body-box must now be screwed to the floor board, the quilts removed, and the roof fixed, partially open, to the body-box; the dummy-board must be fixed, to prevent it slipping, by some screws properly adjusted. Now thoroughly overhaul the hive, to see that there are no little crevices left open where the bees could crawl through; any, if found, must be plugged up. The hive will now be ready to send anywhere within a three or four days' journey. No tapes are required if the frames are wired. (See paragraph 85).

115. Packing Swarms and Driven Bees.—These are best sent in wood boxes having large holes about 6in. square or more at each side, covered with perforated zinc. A box to contain 4lb. of bees should be at least 15in. by 8in. by 8in. It is quite a simple operation to put the bees in these boxes, and is thus done:—Cover the perforated zinc over with some material that will darken the interior of the box, placing it upon a large board, or table, the lid downwards; the box is now opened about an inch, and kept in that position by propping it up with a couple of blocks, one on each side. The bees are then shaken down in front of this box, and they will all run in peaceably; when they have done so, shut the box, drive a few nails in the lid to hold it firm, and cord it tightly. When a great number have to be packed in boxes, a large tin funnel is used. The bees are shot into this; the sides being smooth afford no foothold to them, and they are thus precipitated into the box, which can then be quickly fastened down.

116. Packing Queens for Travelling.—Queens can be sent with perfect safety for considerable distances. To any part of the British Isles is but a simple matter. We are constantly exporting them to all our colonies, and have had the satisfaction of successfully sending them to Persia, a journey occupying over a month, and the greater part of the route being overland in a very hot climate. For particulars of a convenient travelling-box that may be used for short distances, say, three or four days' journey, see paragraph 67.

117. Robbing. — Bees are by nature inveterate robbers. While honey is coming in plentifully, no robbing will take place; but at those seasons when from dearth of blossoms of honey-producing plants nectar cannot be obtained, an exceedingly strong desire seems to possess every bee to obtain that or a substitute in any manner possible. Any bee-keeper who has once had experience of a determined case of robbing in an apiary of any size will not soon forget it. The air is alive with bees dashing about in all directions with angry hiss. Around the entrances of the hives the condition of things is worse, fighting, stinging, and struggling taking place as if their very existence depended upon the amount of damage they could do in a given time. The killed are cast down to the ground in hundreds, whilst all around the combatants are struggling in each other's embrace. Woe betide the apiarist who endeavours to go among this turbulent crowd without some protection in the shape of veil; any living creature will be sure to receive a more than fair allowance of the bees' spite. This condition of things is usually the fault or accident of the bee-keeper; some honey laid about, or syrup spilt, perhaps a hive carelessly left uncovered. Before robbing has grown to such an extent, the fact should have been found out by the bee-keeper—it could then very easily be stopped; but when such dimensions have been reached, it is an exceedingly difficult job. It is very rarely we hear of such wholesale robbery, as when a knowledge is gained of the time of year when such is likely to take place extra precautions are observed. It will, therefore, be to the bee-keeper's advantage if he keeps a very sharp look-out just after the close of the honey flow and until cold weather sets in. Very little trouble need be taken with strong colonies—these will usually look after their own interests; but in the case of weak ones or nuclei, their entrances must be contracted at once to about two bee-space width, and the greatest care must be taken that no honey, honey-comb (having honey or the smell of such attached to it), syrup, or freshly expelled larvæ lay about the apiary. Where a hive is being attacked a tuft of grass laid against the entrance will often baffle the marauders, as in attempting to gain an entrance the besieged can tackle them singly in the labyrinth of grass blades. Carbolic acid smeared on the alighting-board and around the entrance will have a good effect; but where none of these will stop the strife, a carbolised sheet thrown completely over the attacked colony, and left on until just before nightfall, will usually overcome the attentions of the besiegers. Where such will not answer—this is exceedingly rare – the hive must be moved into a dark cool cellar or shed (the inmates being fastened in with perforated zinc), and not returned to its original stand for at least two days, during which time the enemy will have forgotten all about it. The time of season when robbing is likely to take place is in spring,

before honey commences to come in, in autumn after the flow has ceased, or in the interim between the cessation of one description of flower blossom and the commencement of another. Spring robbing is quite a mild affair as compared with autumn. In an apiary where many hives are kept, the application of the tuft of grass, contracted entrances or carbolised sheet will be found most effectual. "Prevention is better than cure"—take the precautions we have advised, keep all colonies strong, and be sure no queenless stocks remain in the apiary, and any serious case of robbing will be unknown.

118. Loss of Mother (Queen) Bee.—The absence of the queen from a hive before the honey-flow takes place is a very serious consideration—in fact it is so at any time, with the exception of very late in the season, when a hive can be queenless for some considerable time without any very serious consequences resulting; but it is advisable to have a young, strong, and fertile queen in the hive at all times. The age of the queen ought very rarely to exceed two years. There are cases when a queen in her third year is as prolific as in her second; such a one should be preserved, if only for rearing others from. Queens are lost in a variety of ways, frequently, when flying to meet the drone, failing, on returning, to enter their own hive. Especially is this so when a number of hives are collected close together, and all are of one shape and colour. Birds occasionally catch and kill a queen. Queens whose wings have become damaged are unable to fly, and so drop upon the ground when swarming takes place, and are thus frequently lost; or in the case of a virgin queen whose wings are imperfectly developed, the same accident may take place. The loss of a virgin queen from a hive which has recently swarmed is a very serious accident, as there are frequently no larvæ young enough to raise into a queen, and such a colony must dwindle away and die. Colonies frequently become queenless in late autumn and in early spring through being over-manipulated. Manipulate as little as possible at these times, and always with great care; do not excite the bees too much. Some thin warm syrup poured between the combs before handling will prevent the loss of the queen at these seasons by what is termed "balling." This is the cause of numbers of colonies becoming queenless. Queens usually live about four years, and when their powers of reproduction visibly commence to fail, the workers supersede them, killing the queen and rearing another in her place.

119. Balling.—When a hive is over-manipulated in the autumn or spring, it will sometimes occur that the workers will form a compact mass around the queen, like a ball the size of a walnut, and will thus suffocate her, unless she is released from their embrace. This is called "Balling." When it is

observed, some thin, warm honey should be dropped freely on the ball: this will cause them to release their prisoner; she must then be placed in a cage for a day, or until the bees will receive her again in a proper manner. Usually, in such cases, they will receive her directly they have quieted down. When a queen is balled she very rarely recovers from the rough usage, unless she is released soon after it takes place. "Balling" is the usual method of bees of taking the life of a queen, although they sometimes sting her to death.

120. Obtaining a Knowledge of a Queenless Colony.—A queenless colony can be detected from outside as easily as from inside appearances, except in late autumn, when it is rather difficult. Almost directly a queen is removed from a hive the bees become restless, running about in all directions in front of the hive and on the alighting-board, flying a few feet from the hive and returning again at once; they seem to be searching for something which they cannot find. This is more noticeable when all other hives in the apiary are quiet. These proceedings will last for a varying period. In the event of there being plenty of young larvæ in the hive, they will not prosecute their search for any considerable time, but will commence making queen-cells and rearing another queen; but where they have no chances of rearing another they are uneasy for the rest of their existence unless provided with one, and will search around the entrance for days. No work will be done, an air of laziness pervades the hive, pollen is rarely carried in, or, if it is, in very small quantities, the pellets being about a quarter their normal size. The inmates, instead of flying from the entrance with a quick dart, listlessly crawl forth, take just a little turn round, and go back again; there is no rushing or tumbling over each other on returning with a load, as a colony in a normal state, but a drowsy, sleepy look seems to settle upon all the community. Queens sometimes die naturally; this is more frequently the case in the winter, and is then very easily detected, as upon the hive being opened in the spring, the absence of brood is an unfailing sign. The loss of a queen in late summer can frequently be discovered by the colony allowing the drones to live, and they will then tolerate their presence all through winter if they are allowed to remain queenless.

121. What to Do with a Queenless Stock.—In spring a queenless colony must be united to one having a queen (see "Uniting," pars. 94 and 95), as then spare queens are most difficult to obtain. In summer the advanced bee-keeper will have ready some spare queens; one of these must be introduced directly on discovering the loss. In autumn either unite to a colony possessing a mother, or introduce a queen. In autumn queens can be obtained in any quantity from dealers. A very good plan is to

drive a skep for anyone who wishes to take the honey, and unite these driven bees to the queenless colony. Always examine a colony eleven or twelve days after the issue of a swarm, to see that it is not queenless.

122. Queen-rearing.—If the queen is old and unprolific the colony must dwindle, as the number of eggs laid is not in proportion to the natural decay of its numerous members. A prolific queen, in early summer, will lay so many eggs that the stock will become over-populous; this is just what the bee-keeper wants, as, by enlarging the hive just at that time, he has a number of willing workers ready to carry in the harvest awaiting for them in the pastures. But if an unprolific queen is in the hive, instead of increasing in numbers as the harvest time advances, the bees, by their indefatigable industry in endeavouring to bring in as much as they possibly can, dwindle gradually away by the extra exertions imposed upon themselves, and get less and less in numbers. As the colony gets smaller and smaller its members, in proportion, relax in their efforts and quickly lose heart, becoming an encumbrance in the apiary instead of a use. Presuming that such a queen is unprolific from some physical failing and not from old age, it would be most unwise to remove her and allow the colony to raise another from eggs laid by this one, as her failings would, without doubt, be perpetuated in after generations; it therefore becomes incumbent upon the bee-keeper to rear queens from specially-selected mothers that have shown their superiority in the apiary. Too much emphasis cannot be laid upon the fact that it is also of the utmost importance that all drones should be reared from mothers showing a marked superiority.

When a swarm issues from a hive the colony remains motherless for a period sometimes extending to three weeks, and, in the case of a queen dying, to a period not less than three weeks; here is seen the utility of the apiarist having a supply of queens ready at any moment to introduce to a colony that has lost its queen, as then the prosperity of the hive is not hindered by any cessation of egg-laying which must take place if there is no queen. Swarming usually taking place just as the honey-flow sets in, a diminution in the numbers of a colony means an equal falling off in the amount of honey brought into the hive.

Then, again, in rearing queens it is desirable to mate them with selected drones; but this, owing to the peculiar nature of their fertilisation, is a very difficult matter. Under ordinary circumstances the selection of drones is not of so much importance, owing to the fact that a colony, before rearing them, is sure to be in a prosperous condition. A poor colony, in a normal condition, will rarely rear drones, thus reducing the chances of any virgin queen being mated with the produce of an inferior queen.

Another point to be observed in rearing queens is the desirability of selecting mothers from colonies whose character of amiability is well marked. Often colonies will be so vicious that it is very unpleasant even for an adept to handle them ; from such queens should not be reared, as the irritability of the mother seems usually to be developed in her progeny.

From the foregoing it is seen that it is much the best plan to have the queens mated with selected drones, as well as reared from special mothers. To accomplish this, we must so arrange the time of departure of the queen on her wedding flight that the selected drones only are flying at that time. Among the different plans for so doing none have been, up to the present, introduced that fulfil all the conditions necessary to ensure success. Causing a colony to raise drones before other colonies have done so is frequently advocated. We can always ensure a colony rearing queens, but not so drones. We must begin by stimulating a strong colony (see "Feeding," pars. 101 and 102) very early, and when the hive is crowded with bees, a frame containing drone-comb is inserted in the middle of the brood-nest ; the queen will then most likely lay drone-eggs in it. In twenty-five days there will be drones in the hive ; these ought to leave their cells about the middle of April, or as much before that time as possible. Feeding must be kept up all the time they are in the hive, until the honey-flow sets in, or very likely they will be killed by the bees. When the drones are on the point of emerging from their cells, another hive, which has been stimulated in the same manner, is deprived of the queen, she being given to a hive that has an inferior one. The bees will at once commence to raise queen-cells ; but if they are allowed to do so without any assistance from the bee-keeper, they will so arrange them on the comb that they will be most difficult of removal without damage. In handling a queen-cell the greatest care must be taken, as the occupant is exceedingly tender; it should always be handled by the piece of comb left attached when cutting it out of the comb. In order that the cells may be built in positions as the bee-keeper desires, a new comb is obtained, and placed in the middle of the brood-nest of a hive from which it is wished to raise queens. In about three or four days this is removed; it will then be found partially filled with eggs. Quite in the middle of these eggs an oblong hole or holes are cut, not less than an inch deep; these are so made that along the top edge a row of cells is left, having eggs or very young larvæ in them. Every other one of these eggs or larvæ must be destroyed, by twisting the end of a lucifer or drugget-pin against the bottom of the cell, and those cells with eggs that are left should be enlarged at their entrances, by means of a small cone pushed gently in. The row of cells on the reverse side of the comb must have all the eggs or larvæ destroyed. The effect of these proceedings is as follows :

Each cell having an egg or larvæ in it will be formed by the bees into a queen-cell, as they are just in the position that seems most desired by the bees for that purpose. As there is an egg only in every other one of the cells, there is sufficient space left for the queen-cell to be completed without its being made to adhere to its next neighbour ; it can therefore be cut out without interfering or damaging any of those contiguous to it. The queen-cells are sure to be built on this comb, as bees, when they have the opportunity, always choose a new one for this purpose. There may be one or two cells built on the other combs, and these can be removed when wanted. In ten days, when this comb is removed, a row of queen-cells will be hanging regularly along from the top edge of the holes cut in it ; it will then be time to transfer these to nucleus-hives.

123. Nucleus-colonies.—A nucleus-colony, as its name denotes, is a commencement or small colony of bees, and is formed thus : Having obtained a hive of a size to take three frames—an ordinary hive contracted by its division-board will do—three combs from a populous colony, with the adhering bees, are placed in it, the greatest care being taken that the queen is not put in with the bees ; it is then covered up, and left for a day. When this time has elapsed, it must be examined to see whether too many of the bees have left to join the old stock ; if so, a frame of bees must be shaken in with the others. It is much the safest plan to do this when the frames are first put in, as there are sure to be some old bees who, when they fly out, will discover their original home, and will thus desert the nucleus. The combs should have both brood and honey in them—the two outside ones honey, and the middle one brood and eggs. It is inadvisable to have brood in the outside of the two side combs, as it is almost sure to get chilled. The nucleus is then ready for the reception of the queen-cells, as by this time the bees will have discovered that they are without a queen.

The queen-cells must now be cut out of the comb by means of a very thin, sharp knife. By some bee-keepers it is advised to cut a hole in one of the combs of the nucleus and insert the queen-cell in the hole so made ; but this damages the comb. The best plan is to get a cone-shaped piece of wood, using it as a mandril, and wind some No. 20 iron wire round it so as to make a spiral cage of sufficient size to only just contain the cell ; then place the same, with the cell within it, between two bars of the nucleus. The top end of the spiral wire being bent at right angles prevents it from slipping down between the frames. The opening in the thin end of the spiral cage must be $\frac{1}{4}$in. in diameter to allow of the egress of the future mother from the cell into the hive. Draw the frames

close together and cover up. This plan is so much handier, as, if it is desired at any time to examine the cell, this can be done by simply turning back the quilt, so very slightly disturbing the bees ; it is also in the warmest portion—the top—of the hive.

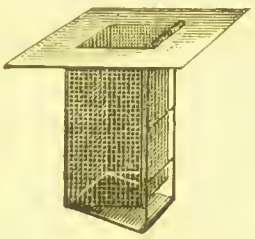
In about two days—the fifteenth or sixteenth from the day the egg was laid—the virgin queen will come forth. She will then stay in the hive for a varying period, extending from three to seven or eight days, and on the afternoon of a bright, warm, sunny day, she will fly from the hive, but usually for only a couple of minutes, during which time she is taking notes of the surroundings, that she may return in safety to the right hive. Returning again, she will in a few minutes take another flight, and will do this every suitable afternoon for some days until she meets the drone (this taking place high up in the air) and afterwards returns to the hive. During the remainder of the afternoon of this day she will continually fly in and out of the hive, but never leave it after again unless it is to accompany a swarm. In about three days she commences to lay eggs. The bee-keeper will thus have a fertile queen ready to introduce to any colony requiring one ; and if the drones have been reared before any others have been so in other hives, the queen will be fertilised by a selected one.

The fertilisation of queens by selected drones at other seasons of the year is very uncertain. We will give the best methods to be adopted to accomplish this end under these disadvantageous circumstances. Upon the evening before the queen is expected to fly, all the nuclei, together with the hive containing the drones, are removed from their stands, placed in a cool, perfectly dark place—the entrances of hives being closed with perforated zinc—and left until the following day about 5.30 or 6 p.m. They are then brought out, and placed on their respective stands. On no account intermix them. As the drones from all other colonies have ceased flying, or are just returning, at this time a good chance is obtained of getting the queens properly fertilised. When the hives have all been placed in position—which must be so that the sun shines directly in the entrances—a little honey is smeared just at the flight-holes of the nuclei, and some thin, warm honey poured over the frames of the hive containing the drones ; this raises a great commotion in the hive, and consequent increase of temperature. The drones will then fly forth, and the queens likewise. It is very easy to get the queens to fly out, but more difficulty is experienced in getting the drones to do so. Sometimes it is expedient, if they will not fly, to lift out a frame, and toss them in the air ; but do not do so if there is a possibility of their flying without such extreme measures.

A few cautions anent queen-rearing are advisable. Never expose queen-cells in the direct rays of the sun, nor in cold air or wind, for any length of time. Do not violently shake or turn upside down a frame having queen-cells in it. Never leave a nucleus, before the queen is mated, without *uncapped* brood and honey. If it is required to remove the bees from off a comb having queen-cells, they must be brushed off, not shaken. Always keep entrances of nuclei contracted to about two bee-space width. If a queen-cell is destroyed by having its side torn open, there is most likely to be a queen already in the hive. A second cell can be given to a nucleus if the first is destroyed or its occupant dies, as also another cell after a queen has been removed, provided its strength has been kept up by the addition of brood.

124. Queen-introduction.—A colony that has lost its queen can be re-queened very easily if certain precautions are taken when placing her in the hive, or, as it is usually termed, "introducing" her. If these precautions are not taken, the bees will certainly kill any alien queen that may enter; there have been a few exceptions to this rule in the case of queenless colonies. For many years the only system advocated and adopted was by caging. This was performed by inclosing the queen in a cage made for the purpose, and allowing her to remain thus protected from the assaults of the inhabitants in the hive for about two days. On the expiration of this time the bees had got acquainted with her, and when released she would be accepted by them with the usual tokens of filial respect. Caging is not the perfection of queen introduction, though for a novice it is about the safest method. Often, while confined, the mother-bee may poke a leg through the bars of the cage; this is instantly seized by some of the crowd of irritated bees who thickly surround the cage containing her, and it may be torn off. Although the actual loss of a portion of a leg does not seem to affect her prolificacy, yet the whole of the leg, even to a part of her body, has been known to be torn away and death result. To get over this difficulty seems to be impossible; therefore, we must remember that with queen-introduction a certain loss of mothers is inevitable. We have been most successful with the system called "direct queen-introduction," though in the case of novices results are not always as satisfactory as with us. The first style of cage introduced was the "pipe-cover" cage; this is a dome of wire net soldered on to a narrow rim of thin tin, about 1½in. in diameter. When a mother-bee is to be introduced she is placed in the cage, and then the cage is slipped on to a piece of cardboard. It is placed in its position on the face of the comb, the card is gently withdrawn, and the cage pressed with a screwing motion into the comb, until firmly fixed. The mother-bee is allowed to remain thus imprisoned

for forty-eight hours, and then released. This system entails a lot of trouble, as the comb has to be removed from the hive twice, and at the first removal the greater part of the bees must be brushed off. The next style of cage is better; it is called by several names, but the illustration (cut, page 77) will give an idea as to its appearance and make, though it does not in the engraving appear nearly long enough. This cage should be 4in. in length, 1in. broad, and ½in. thick. It is made of perforated tin or zinc, and is placed between two combs, the flange on the top resting on the tops of the frames. When the mother-bee is to be released, the wire on the top is pressed down; this opens the door at the bottom and she walks forth into the hive. Yet another form of cage we have found most successful and cheap. It is made as follows: Obtain a piece of wire cloth, the same as that used for wire bee-veils, make a tube of the same dimensions as those given for the preceding one, also two wooden plugs, fitting fairly tightly, to close top and bottom, as a cork in a bottle; into the bottom plug insert a piece of wire, so that it passes close along the inner side of the cage and out at the top, at the side of the top plug. Place on the top of the bottom plug a piece of "Good" candy (this is made by mixing icing sugar and warm honey together to the consistency of putty); remove the top plug and put in the mother-bee, replacing the plug to keep her in. Now bend the free end of the wire at right angles to the cage; this prevents its slipping down between the combs. With a knife uncap some of the honey-cells at the top of one of the combs, and place the cage with its flat side close against where the honey is so exposed; this, together with the "Good" candy, provides food for the mother while she is imprisoned, previous to the bees feeding her through the bars of her cage. Now push up the frames close together, cover up the quilts, and leave her for forty-eight hours. To release her, bend up the wire, which must be fairly thin, take hold of the top of the cage between the finger and thumb, and press the wire down: this will push out the bottom plug and so release the mother-bee.



Queen Cage.

125. Direct Queen-introduction.—This system is frequently called the "Pond-Simmins." It is almost perfection, or as near that as it is possible to get. We have introduced hundreds of queens with but few failures—not 5 per cent., and not nearly as many as by means of a cage—with much less trouble, and also—which is of far greater importance—saving two days' breeding by the queen. It is a very simple manipulation, and is thus performed: Remove the queen to be superseded from the hive about 9 or 10 a.m., then cover up properly, and leave the

colony undisturbed until about 9 p.m., or some time after darkness has set in. Take the queen that is to be introduced and place her in a small box, *alone and without food*, keeping her thus for not less than half an hour. While she is imprisoned great care must be taken that she is not chilled; it is a good plan to place the box containing the queen under the waistcoat to prevent such an accident. Now get a lantern, go to the hive and turn up a corner of the quilt; drive the bees that come to see what is going on back with a puff from the fumigator, and allow the queen to run in between the combs. Be very careful to keep a sharp look-out that she does run down, as frequently she will get in the folds of the quilt, or under the lugs of the frames. The best method of putting her in is to place a card under the open reversed box, then lay it on top of the frames and slip the card away; for this purpose a little glass-topped box is preferable, as then one can see all her actions after the card has been withdrawn. Now cover up the hive, and do not disturb it again for at least forty-eight hours. If you are very impatient to know whether the queen has been received properly, spread a sack or cloth in front, and under the entrance of the hive, before the introduction. If she is killed, you will find her lying on this cloth the next morning; but you will, if the above directions are strictly adhered to, no doubt have to look for her in vain. Other systems of introducing queens come more properly under the denomination of "Uniting" (see pars. 94 to 98).

126. Placing Supers on Hive.—There may be, perhaps, with many, very little importance attached to the manner in which supers are placed on a hive; in fact, we are well aware that in dozens of cases they are simply "clapt" on, the cover replaced, and then left to their (or rather the bees') fate. No notice of season is taken: they may be put on in March, if there are a few fine days, or in July, when most of the harvest is over. What is required is observation. When colonies are strong—which means that they must be thickly packed with bees on at least ten frames—it will be time to think of supers. If there are but few flowers blossoming, do not trouble to examine the bees: but as soon as the meadows and hedgerows begin to be well sprinkled with the advance guard of the army of wild flowers to follow, then remove the quilt from off the frames, and note whether the cells on top of the combs are beginning to be elongated. This can easily be seen by the new (white) wax with which the bees are adding to the walls, that they may accommodate the precious nectar that is then commencing to be produced by the flowers; if this is so, the supers must be put on at once. If a section-rack is to be the super, after removing the quilt, place it on top of the frames; it will then

be found that it does not entirely cover the frames. Along the side the spacings between the frames are open; if this is left so—and we have found hundreds of such cases—the heat from the bees ascends into the roof of the hive instead of the super. The bees are thus exposed to quite a cold current of air, which is frequently sufficient to prevent their going up in the super or building combs in the sections; therefore, strips of some warm material must be laid along each side, and the quilts placed on top of the rack, to economise the warmth and to prevent the bees getting inside the roof of the hive. The super must now be wrapped up as warm as possible, to prevent any sudden change in the outside temperature being felt within it. If a super is ill-protected, the bees will, on a cold night, descend into the body of the hive for warmth. By this all work is suspended in the super during this time, and it will be quite late in the morning before it will be again filled with the bees, a loss of twelve hours out of the twenty-four being the result. Bees work almost as energetically between sunset and sunrise as they do during the day; but this work is confined to the inside of the hive, such as comb-building, feeding larvæ, evaporating and sealing over honey. Some racks are made with wood flanges to take the place of the strips of quilting laid along the side; these will be found a very serious drawback, as much more space is thus given the bees to propolise, the racks being so firmly glued down that it is quite a labour to remove them, as well as causing great irritation to the bees when so doing. When large supers are used (not being sectional), excluder zinc is placed between them and tops of frames; but with sectional racks it is the best plan to discard it, thus allowing a freer passage for the bees into the supers; for reasons of this see "Queen and Drone-Excluder" (par. 58). Where four-bee-way sections are used in racks, slotted separators (as illustration) must be used.

Slotted Separator (No. 2).

127. Removing Supers from Hives.—This manipulation, until we introduced the "Super-clearer," was always a rather serious task for the novice, by reason of the large numbers of bees present that had to be contended with, though at the season when it is necessary to do this the bees are a rule in their gentlest mood; that is, during the honey flow. In the case of sectional supers, never remove just one or two or a part of the sections from a section rack, as is often done, for nothing discourages the bees more than this; in fact, we have often found them discontinue

work in the super for the rest of the season when treated in this fashion. A very good motto to remember is "Handle supers, not sections." When "tiering up" (see par. 128) it is necessary to remove the super or supers; this is also necessary when it is desired to put the super-clearer in position, so that almost the same directions will apply in either case. First provide yourself with a strong screw-driver, some pieces of broken section, and your subjugating cloths. Very quietly insert the end of the screw-driver between the super and the frames at one of the back corners, prise the super up very gently, and slip one of the pieces of broken section under; now serve the opposite corner in the same manner. Perhaps one or more of the frames will be stuck fast to the bottom of the super, and if you prise the super up much higher, the frame or frames will break away and drop back into their place with a sudden jerk; if they do, cover the hive up and leave it for an hour or so as the bees will instantly endeavour to avenge such rough treatment. This accident will make the most mild-tempered bees vicious. To prevent such an occurrence prise the super up about ½in. at one end, and then notice if by so doing you lift any of the frames; if so, very gently push them into their place by pressing upon the lugs of same. Now you have loosened the super, which is raised by means of the pieces of broken section, away from the frame tops, leave it thus for about five minutes, the bees will then be busily engaged in clearing up the little honey which is sure to be exposed owing to the breaking away of the super from the frames. Now, bodily and quietly lift off the super either to put another on or to put on the super-clearer. No subjugation is really necessary at the time of "tiering-up," as the bees will then be bringing in honey very fast and so will be in an amiable temper; also, it is inadvisable at such a time to drive the bees out from the super as will be done by subjugation. But when it is desired to remove a full super a subjugating cloth should be spread right over the top, in the place of the quilts, for a few seconds or until you can put the super-clearer under; it must then be removed and the hive left until the super is free from bees. The most noticeable effect when using a super-clearer is that the sections will never be damaged ("pin-holed") by the bees, as they always are, more or less, especially towards the end of the honey flow, when such an appliance is not used. The bees are in an almost normal condition during their exodus, as they have direct communication through the trap of the super-clearer with their comrades in the body of the hive, and only vacate the super when passing from super to body-box. Any odd super, such as a skep super, can be cleared of bees by putting a super-clearer over its mouth, thus allowing them to escape through the trap but preventing their re-entrance; or by placing the super to be cleared of bees in a box of sufficient size to accommodate it, and using the clearer as a lid to the box, in a couple of hours the super will be clear.

128. Tiering-up.—This is a system applied to the manipulation of supers or sectional racks upon the hive, and is without doubt the most effectual method whereby swarming can be retarded to a great extent, or almost entirely prevented. The idea of using supers in this manner is that a sort of telescopic power can be given the hive, and it is this power that forms the fundamental principle whereby non-swarming results are obtained. It must be the apiarist's chief aim in supering upon these lines that just a trifle more room is allowed in the hive than the then present necessities of the bees require; hence, their natural aptitude for entirely filling their hive with combs, honey, and brood before swarming, is allowed to absorb their attentions instead of swarming. Presuming that a hive has one rack of sections on, and this almost full, the bees, on account of there being little or no more work to do, would swarm; but if just before this event takes place—that is, when the rack is about three-quarters full—it is removed, bees and all, a fresh rack put on in its place, and the removed one placed on top, a space is given the bees to fill, and they start work in the lower, at the same time completing that in the upper, rack. By this arrangement, removing the top storey when full, raising the lower one when three-quarters full, and placing an empty one underneath, the hive is kept just too large for the bees' requirements, and the work progresses at a rapid rate. When the honey season is at its highest, on the enlargement taking place the bees will build comb and store it with almost the vigour that characterises a new swarm. In some cases three and even four racks can be piled one on top of the other—we have on some occasions had as many as five—thus giving sufficient room for large quantities of freshly-gathered honey to be evaporated at the same time; if this storage space was not provided by the apiarist, the bees would most likely swarm, but upon their being thus provided for all ideas of an exodus will be given up.

129. Doubling and Storifying.—The first is a plan for obtaining extracted honey, and is a very effectual means of obtaining an apparently large return from a single colony; but two colonies are used in order to carry out this system. The hive to be doubled is one that has a sufficient capacity, or can be so enlarged that it will accommodate two or more rows of frames on top of each other. This hive having been brought to a very populous condition is, just before the honey flow sets in, provided with an upper storey. Another hive in as equally a prolific condition is deprived of its brood; the frames being taken out, the bees are shaken off back into their hive, and afterwards provided with sheets of foundation, or other combs, and treated exactly as a swarm. The removed brood is then placed in the upper

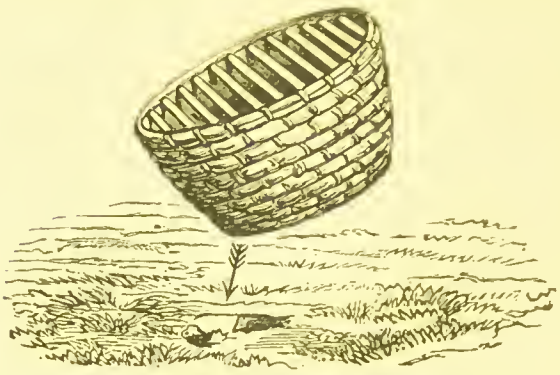
storey of the first hive, the quilts being taken from off its frames, and placed on top of the upper one. A quantity of the bees from the lower will ascend into the upper storey and rear the brood; this, continually hatching, will provide a large population, who will hasten to bring in the harvest, storing it away in those cells recently vacated by the brood; thus, the combs on top act as a super, the honey being extracted from them as soon as sealed over. In some cases, directly all the brood has hatched out, a third storey with combs is placed between first and second; this, together with the lower, will be used by the queen for breeding in; the upper one, after being extracted from, is placed beneath the second tier. Four rows of frames in some districts can be used, but a stock to be able to fill this number must be exceptionally prolific, and the country around a good honey-producing one. We do not recommend this system, as the honey is usually not of so good a colour—a very important factor in the sale of same—as that from shallow-frame supers.

130. Working with Shallow-frame Supers.—Extracted honey is far superior in colour, flavour, and aroma, if produced in the most modern form, *i.e.*, by using shallow-frame supers. Considerable opposition was offered to this system when first introduced some few years ago, but the great superiority of the product when stored in these appliances has very rapidly overcome the opposition to their use. The cause of this opposition was the, at first sight, very natural one of having two different-sized frames in the apiary. Now, if it were proposed to have two different sized body-box frames the opposers would have very good grounds for their opposition, the reason being that the body-box frames of one hive would not be interchangeable with the body-box of another hive. With shallow frames we know that these simply belong to the supers, while the standard-size frames belong to the body-boxes only; that is, one description of frame fits supers only, the other size body-boxes only, in just the same manner as sections fit supers and standard-frames fit body-boxes. As a matter of fact the shallow-frame supers have come to stay for good. A shallow-frame super can be used to produce honey in combs of varying thicknesses. This is accomplished by spacing the frames further apart, so that the bees have plenty of room to elongate their cells on each side of the septum (midrib) of a comb (see "Metal Ends," paragraph 68, page 40). It is well known among apiarists that bees when storing their honey elongate their cells, where there is sufficient space to do so, almost indefinitely. We have measured a cell just over 2in. in depth as against the normal size of a little over $\frac{3}{5}$in. The advantage ot having these thick combs is that a larger quantity of honey can be stored in proportion to

the amount of comb (wax) used. A lesser amount of labour is entailed when uncapping, as it is necessary to uncap ten combs of a normal width as against eight wide-spaced, and each lot contains about the same weight of honey; this, all must agree, is a very important item. The disadvantage of the wide spacing is that it does not answer so well as the narrow during bad seasons, or in districts where the honey-flow is not very extensive; it requires a rapid flow of honey to fill them as they should be: therefore, it is the best plan in poor districts to use the ten-frame or normally-spaced super. With shallow frame supers, or any other that is not sectional (containing sections), a sheet of excluder zinc must be laid flatly on top of the frames, the holes of such being parallel with the bars of the frames. These supers are "tiered up" in exactly the same manner as that recommended for supering with section-racks.

131. Condemned or Driven Bees—Bumping.—Allusion has been made in par. 94 to condemned bees. These at certain times are of great utility to the modern bee-keeper. For generations it has been the practice of keepers of bees to kill their charges at the end of autumn—by suffocating them with burning sulphur—in order to obtain the honey collected by them during the preceding season The straw-skeppist usually "takes up," or, as it is called in the North, "smeakes"—*i.e.*, kills—his bees about September, quite a long time after the honey flow has ceased, and so obtains less honey from them than he would have done if taken shortly after this event. It would be much better if he allowed some expert bee-master to drive his bees about the commencement of August, excepting in places where heather or buckwheat grows, when it would have to be done about the first or second week in September. There are two methods of obtaining condemned bees; the first is by the ordinary method of Driving (par. 90), and the other by "bumping." This latter is much the more expeditious of the two, and is thus performed: Go to the hives and stop up all the entrances —both those that have and those that have not to be taken —with a tuft of grass placed in lengthways, not screwed up anyhow, or a piece of perforated zinc; then give the first hive to be operated upon a few puffs with the fumigator, replace the grass, and with the open hands regularly tap the outside until a great commotion is heard within; then allow them to remain for two or three minutes, withdraw the grass, give a few more puffs, and gently turn the skep upside down. If there are any sticks through the hive, these must be withdrawn with a pair of pincers. Now drive the bees down from the tops of the combs, and raising the skep up in the two hands, "bump" it upon the ground in the exact position shown in the engraving; this will break the attachments of the combs from the roof and sides of the hive

The combs are lifted out one by one—the bees brushed back into the hive—and when free from bees laid in a pan having a cloth to cover over, as each comb is put in, to prevent the ingress of any flying bees. After thus treating all the combs, the hive containing the bees is to be placed in its original position for a time, in order to collect the flying bees. Treat every hive to be taken in this manner, and allow the bees to settle quietly; then throw two lots into one, by placing two of the skeps mouth to mouth, and jerking them suddenly on the ground. Cover over the lower one (having now all the bees in it) with a piece of strainer-cloth, and tie firmly round with string.



Method of Removing Comb from Hive by Bumping.

One or two cautions must here be given. Be particularly careful that all stocks are healthy. Do not "bump" exceptionally full colonies having combs heavily laden with honey, without driving a portion of the bees out first. Any very deep hives had better be driven, as frequently the combs break in the middle, especially if it is a warm day and the combs new. Remove all stoppings from entrances of other hives when the work is finished. Endeavour to take condemned bees during late afternoon or early evening. Leave no litter about the place, and if robbing should happen to commence very seriously, leave off, or the owner will think little of the taker's expertness. These bees can be made up into strong colonies for the next season by placing them upon ready-built combs and feeding up as fast as possible, using the feeder described in par. 59. A good many bee-keepers have an idea that condemned bees can be placed in an empty hive, fed up, and then come out the next spring in as good a condition as stocks; this is an egregious blunder, as all their stamina is wasted by the extra amount of work imposed upon them by comb-building. They must be put on fully built-out combs if the greatest advantages are to be reaped from them. Foundation alone is almost as bad as empty hives, but foundation alternated with full combs, if the bees are put in early in the season, answers very well. Condemned bees can be used to strengthen weak colonies before the winter sets in, as also provide queens for queenless stocks, and increase the numbers in nuclei to form stocks (see "Uniting, pars. 94 to 97).

132. Wiring Foundation.—All foundation for the body-box is best wired into the frames ; not only is it less liable to "sag," but straight combs are always the result. Foundation can be bought ready wired, but it is much more expensive, and less effective than if made as described in par. 85.

XI.—HONEY.

133. Extracting Honey from Supers.—This description of extracting is the one usually practised. Some, but very few, bee-keepers extract from the combs having brood in them; this is greatly to be condemned. Not only is there a great chance of killing the brood, either by chilling it or throwing it out of the cells, but the honey gets soiled with lacerated brood and pollen. Having removed a quantity of sealed honeycombs from the doubling hive, and jerked and brushed the bees from off them back into the hive, replace them with empty combs, allowing the unsealed ones to remain in, placing them in the centre of the empties. Take the full combs indoors, preferably in a warm room. Have ready a pair of uncapping knives, a jug of hot water, a pan for the cappings, and the honey extractor nicely cleaned out. With a few combs these are all the requisites necessary, but where a large number have to be extracted it is essential that you have, instead of a jug of hot water, some receptacle that will keep the water at about 140degs. Fahr., or long before you have finished uncapping the water will be too cold. Place the knives in the hot water, but before doing so see that they have a very sharp edge. Now hold a frame by one corner, resting the bottom corner in a dish, and then, with one of the knives, make a shaving sort of cut upwards, and just underneath the cappings ; these will come off in a sheet, and lay upon the broad blade of the knife. As soon as the knife begins to drag, replace it in the hot water and use the other. Having removed all the cappings from one side, turn the comb, and uncap the other, and place it, when finished, in the cage of the extractor. Take another comb, and, after uncapping, place it in the opposite cage of extractor ; thus, having two combs will balance the cages properly. We are presuming that a cylinder extractor is being used ; the one called "The Little Wonder" has only one cage. Now twist the handle of the extractor, gradually increasing the speed until you hear the honey pattering upon the sides of the tin or honey-catchers. Keep up this speed for about half a minute, but do not increase it. By experience will be found just the right speed necessary to throw out the honey without damaging the combs. When one side of each comb is finished, reverse them and extract the

Uncapping Knife.

other. No combs under two years old should be extracted from, as, being so very tender, they will usually break; this does not apply to those which have been properly wired (par. 85), or where shallow combs have been used, as alluded to in "Doubling" (see par. 129). After the combs have been extracted from, they should, if it is not required to use them again at once, be placed behind the dummy-board of the hive, to be cleared out by the bees. Where empty combs are not obtainable, two or three full ones can be taken from a hive and replaced with sheets of foundation, these full ones extracted and put in the next hive to replace full ones taken out; and so on right through the apiary. When it is imperative that new, unwired combs should be extracted, one side should be partially emptied, and then the other side wholly, reversing the comb again to finish the first side; this is a very good preventive of breakage.

For removing the honey from partially-filled or broken sections, a good makeshift way is to place the comb in the centre of a good-sized piece of muslin, gather up the ends, and tie them firmly round with string, so as to leave the comb in a bag; then suspend the bag in a warm place, or before a fire, with a dish underneath to catch the honey. The comb can be crushed by the fingers whilst in the bag. If quicker extraction is required, a weight can be hung from the lower end of the bag. This will force the honey through the muslin.

134. Extracting from Body-box of Hive. — This should only be done where it is found that the queen is "crowded out" by the cells being loaded with honey, and then only those combs that are free from uncapped brood; these combs should have the honey-cells uncapped, the honey extracted, and then returned to the middle of the brood-nest for the queen to fill with eggs. If it is very late in the season, be careful not to extract all their stores, or they will have to be fed. It is not very often that a colony will so fill the combs in the body-box if they have been properly attended to and allowed sufficient super room; although, just at the latter end of the season, much of the honey is stored in the body-box. In heather districts the combs will usually be found to be filled with honey at the end of the season.

135. Extracting Heather Honey.—Heather honey cannot be extracted by means of an ordinary honey extractor, it being of so dense a nature. A press has been invented which squeezes the comb, the honey escaping through perforated zinc and the comb being left as a cake in the press. The cheapest form of press is that made by Messrs. Turner and Son, and sold by most ironmongers as a "vegetable presser"; it costs from 1s. to 2s. 6d. There is another, but more expensive, the invention of Mr. Raitt.

The honey coming from these appliances is very clouded with the small particles of wax broken off by the pressure. Heather honey is best eaten in the form of sections.

136. Treatment of Honey before Packing. — The honey accumulated in the extractor should be strained into tall vessels having treacle-valves at the bottom. All the cappings and droppings from the combs should be strained into the same receptacle, and should then be allowed to stand in a warm room for some days. During this time—which will vary according to the density of the honey, and also the temperature—all the particles of wax, air-bubbles, and any thin, unripe honey that may have been extracted will rise to the top, leaving clear, thick, well-ripened honey at the bottom, which can then be drawn off from the treacle-valve into nice white, clear, transparent glass bottles, either holding 1lb. or 2lb. These bottles should be corked, and tied over with vegetable parchment, first soaked in milk or white of egg, and tied on damp; it will then, on drying, stretch smoothly over the top, giving the bottle quite a nice appearance. The bottles should then be labelled "Pure British Honey from the Apiary of———," filling in the name of the producer in the blank space. There are a large variety of honey-labels sold, some of very good design; one description can be bought having either English, Welsh, Scotch, or Irish Honey upon it, according to the desire of the bee-keeper. All bottles, after being nicely wiped, should be wrapped in bottling paper. When extracted honey is intended for exhibition, it is usually taken from sections, unless shallow frames are used expressly for this purpose. After being extracted, it is heated, by means of steam or hot water, until it has fined down and become bright; fire heat must on no account be used in direct contact with the bottles. This system of heating honey is bad, as, unless a great amount of care is exercised, nearly all the flavour is destroyed. Honey when once highly heated rarely granulates thoroughly afterwards.

Sections after being removed from the hive should have all propolis and brace-combs nicely scraped off; they should then be glazed — a sheet of glass, of the exact size of the section, placed on each side, and a strip of white paper, $\frac{3}{4}$in. wider than the section, pasted round, turning the two $\frac{1}{4}$in. edges left over the face of the glasses to secure them in their place. Boxes having glass tops and bottoms are sold for this purpose. A much better method of packing is in tin boxes with glass sides; this style was first shown at the Indian and Colonial Exhibition, by Mr. Griffin, where it attracted little attention, but was afterwards improved by colouring the tin, and is now kept by a dealer who has sold large quantities. It is, without doubt, the neatest package yet introduced, but rather expensive—so much so, that it will only answer for show purposes. Sections should be stored in a warm,

dry place, where the temperature does not fall below 50degs. Fahr. A higher temperature is preferable.

137. Packing Honey for Travelling. — In sending away extracted honey by rail or otherwise, it is better for it to be packed in stout tin vessels—small quantities in self-opening tin boxes, and larger in properly constructed tin cans. Where it has to be sent away in glass bottles, each must be surrounded with straw to prevent breakage ; this is the best material, when properly applied, for packing.

Sections must be tightly packed in a box, and this box either packed in another with straw, or—as we have found very successful—provided with a thick straw cushion on its under side and edges ; this is made as follows : Obtain a piece of bacon wrapper, or any cheap strong material, about 8in. or 9in. larger each way than the bottom of the box ; spread this on the ground, and lay a good armful of straw on it ; now place the box on top, and gather up the edges of cloth, tacking them to the side of the box. See that there is plenty of straw, especially at the corners and bottom. Label the box "Honey in the Comb," "Very Fragile," "This Side up, or will be Broken."

Crates for the conveyance of sectional honey are made by bee-appliance manufacturers, but are very expensive. They usually consist of a box within a box, the space between being fitted with chair-springs.

XII.—DISEASES OF BEES.

FORTUNATELY for the bee-keeper, bees are less liable to disease than any other description of stock. Up to the present time there are only two kinds that claim any attention, namely, dysentery and "foul brood." To those who have studied bees and noted well all their little failings, this short category of diseases is not the limit. Without doubt, in time to come, when this subject has been fully studied by scientists, it will be found that "foul brood" will have to be divided into several distinct diseases, although all affecting the brood in its larval or pupal stage. But little is known further than that it is a bacillus, varieties of which are presumed to be the cause of most contagious and many other diseases known to the medical faculty. We wish to impress upon all bee-keepers the necessity of using the most stringent measures to prevent spreading disease among neighbouring apiaries. "Foul brood" is gaining ground in these Islands. Only those who by their duties are brought into communication with the outside world of bee-keepers have any idea as to the extent that this plague has increased lately. In one district we are cognisant of it was imported with a single colony of bees, which the owner refused to destroy ; now it has spread in all directions.

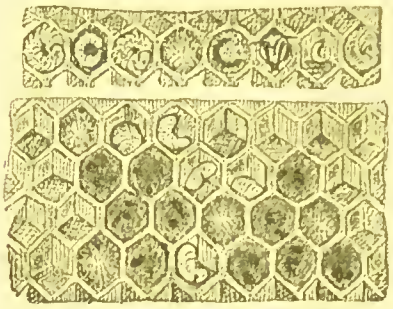
Thus, one person's folly or selfishness has caused misfortunes too numerous to particularise.

138. Dysentery.—This disease, as its name implies, is a form of diarrhœa. It affects bees during late winter or early spring. The causes are insufficient or unwholesome food—mostly the latter—dampness, and often disturbances occurring during what ought to be a lengthened period of semi-hybernation, preventing the repose necessary at such a time. The bees consume a much larger quantity of honey than is natural for them, and having, on account of the bad weather, no chance of going abroad to relieve themselves, their bodies become distended with the consequent accumulation of fœces, which produce inflammation, dysentery, and death. Feeding very late in the autumn produces unwholesome food, as the bees being unable at such a time to seal these stores, fermentation takes place, when the food turns acid. Feeding with syrup made too thin is also another cause; there being too much water in the food, the bees are unable to evaporate it before the cold weather sets in, and it turns sour. By this it will be seen that if any food is fed to the bees after the temperature has fallen below the point at which wax can be manipulated by them into cell cappings, it must be in a perfectly dry condition, such as candy, dry sugar, unflavoured barley sugar, or sugar candy. The signs of dysentery are: Soiling the combs, the inside of the hive, and around the entrance, with a dark brown, semi-liquid substance, having a very nauseous smell, the bees themselves being frequently soiled with the same; their abdomens become unnaturally distended, their numbers decrease, and ultimately the stock, if not attended to, dwindles away and perishes. The cure for this disease is very effectual: it is simply to remove the cause and supply a healthy *regimen.* Remove the bees—in a warm room—to a clean, dry hive, and supply them with warm combs of honey; then cover up with warm, dry quilts, and place them on their original stands. If the weather is cold, it is imperative that this should be done in a warm room; but if a bright, warm day, it can be done in the sunshine; but the fresh hive and combs must be well warmed before the transfer. It is a very good plan to put a bottle of hot water on the top of the quilts for a short time after.

The signs of dysentery must not be confounded with the natural marks made by the bees outside a hive after they have been confined to it by bad weather for some considerable period. These marks are quite in accordance with what might be surmised; they are always outside, on the roof, or surrounding objects, and very little around the entrance.

139. Foul Brood.—Various have been the surmises as to the origin of this disease. It is not a modern importation. Many

ancient writers speak of the loss of their bees by disease, even as far back as Virgil, and Dryden in more recent times. A district in our own county, Berks, was celebrated some half century ago for the number of its bee-keepers, but through disease has ceased to be so, it now being quite the exception to find a bee-keeper in the district. Foul brood is the bee-keeper's bane. No good will accrue from inquiring into its source; it is here! Let it be stamped out! The appearance presented by this disease is only to be observed in the combs. As its name implies, it is a disease of the larvæ or pupæ, although it can be microscopically traced in the imago stage. Remove a frame from a hive affected with this disease; the first object that meets the eye is that some patches of cappings are very much darker than the surrounding ones, and these, instead of being convex, as healthy ones are, are irregularly concave. In some of these cappings there are punctures, as though the bees had commenced to remove them, but had been driven away by the unpleasant contents. Remove the cappings from one of these cells, and insert the end of a lucifer match; withdraw it, and a dark brown, semi-liquid material will be brought forth, adhering to the end, which can be drawn out into a thin line, as can be done with treacle or partially dry varnish; the smell of this is most offensive, reminding one of putrid fish. In many of the uncapped cells the larvæ are in abnormal positions; in others, all that remains of them are masses of dark grey or dirty yellow substances. These have the same nauseous smell as before described. In a healthy comb—as top row of cells in illustration—the larvæ are always curled round in the cell; this position is rarely seen with diseased larvæ after the disease has commenced to attack them. All the larvæ of a healthy colony are pearly white, but the diseased are yellowish grey. Owing to the destruction of the larvæ, the colony gradually dwindles, and ultimately becomes a mass of rotting brood; at this time the disease can be detected by the smell which emanates from the entrance, at some distance away from the hive. A colony slightly affected has the same smell, but this is only noticeable on removal of quilts from top of frames, and can rarely be smelt at the entrance. Another form of "foul brood" is frequently met with, in which all the various symptoms of the former virulent kind are seen, but with little or no smell.



Foul Brood, with Row of Healthy Larvæ on Top.

This has had the name of *Bacillus minor* given it. With this disease many of the brood reach the stage of the perfect insect, but die before emerging from their cells ; the larvæ also dry up in the cells instead of—as in the virulent form—remaining in a semi-liquid condition. "Foul brood" is exceptionally contagious ; it can be carried on the hands or clothes of the apiarist from one hive to another. As soon as one stock in a apiary becomes affected, it quickly travels from colony to colony, and, if not checked, will destroy all. Many have been the methods submitted for curing this disease, but none seem absolutely certain in their effect. By an antiseptic system of treatment the disease has been checked but never cured without the destruction of combs, eggs, larvæ, and pupæ ; this is almost tantamount to a destruction of three-fourths of the colony. The bacillus in what we may call its energetic stage is easily killed with a minimum of danger to the bees, but unfortunately it has a knack of changing into the spore stage—we will liken this to a hybernating condition—or *vice versa*. In the spore condition it is impossible to apply an antiseptic of sufficient strength to destroy it without killing the bees ; therefore, when a colony is affected with this disease, we must adopt drastic measures. The greatest danger arises while the bacillus is in the spore condition, as, according to scientists, the spores will float in the air and so enter other hives, where, if they happen to alight on suitable media, they will change into the energetic condition and commence increasing enormously by division. Both in the energetic and in the spore condition the bacilli can be carried upon the hands or clothes, unless these have been thoroughly disinfected. The idea of administering drugs to a colony, except as a precautionary measure, must be given up. It is disappointing to have to give this advice, yet the therapeutical researches of modern scientists have not yet found a suitable medium which could be used by all classes of operators alike. Although it seems at the present time that the disease, from a bee-keeper's point of view, is incurable, yet an attack need not necessitate the destruction of the hive appliances. We find that neither the bacillus nor the spore can exist in a temperature above 212deg. Fahr. ; therefore, if all hives and other infected appliances are thoroughly boiled, so that this degree of heat reaches every chink and cranny, perfect security from contagion is insured. We have cured many colonies by what is called the "starvation plan," but although you may cure nineteen cases out of twenty by this method, yet the twentieth may not be cured, and will again infect the other nineteen. We will, however, describe this plan. First remove all the bees from the diseased colony into a clean skep or box and fasten them in with strainer-cloth tied over the mouth of same. This must be done at a time when all other bees have ceased flying, and the entrances to other hives near at hand must be secured, so that

none of the bees from the diseased colony may enter. The bees in the skep, or box, are to be put in a cool, dark place for forty-eight hours without food. Remove all the combs, both brood and store, from the diseased colony and at once burn them. Next, by boiling, thoroughly disinfect hive, quilts, frames, &c. When dry, fit up the frames with starters of foundation only, and at the expiration of the two days' imprisonment, return the bees to their clean hive and feed them for a fortnight with medicated syrup. (See page 41.) Preventive measures are taken as follow. Into each hive, before covering up for winter, five or six pieces of napthaline (obtainable at any drysalter's at 3d. or 4d. per pound), about ½in. square, should be placed on the floor-board (do not leave half the quantity in the hive during summer); and if there are diseased colonies near, the bees should be fed—if feeding is necessary—on medicated syrup. The ground should be dug in for at least 6ft. around any hives that have contained diseased colonies. All colonies should be kept as clean and dry as possible at all times, whether disease is prevalent or not. On no account use second-hand appliances unless you previously boil them. Never feed honey to a healthy colony, unless you know for certain that it is from a healthy colony or colonies.

140. Cautions to be Rigidly Observed in Dealing with Foul-Broody Stocks.—On no account handle a healthy stock after manipulating one diseased before disinfecting the hands with carbolic acid solution or carbolic soap. Prevent strange bees from visiting diseased colonies by performing all manipulations with the latter indoors or under a tent (see page 50). Do not allow any portion of your clothes to touch, or become soiled with, the honey of diseased colonies. Always roll up your sleeves, and handle with bare arms. Wear, if possible, a linen or calico overall, and remove this when finished. Never place bees in a hive that has been tenanted by a diseased colony, unless it has been thoroughly saturated with strong carbolic acid solution (preferably hot), inside and outside. Destroy by burning all quilts and frames, as these can be replaced at a very moderate outlay. Keep entrances close when robbing is rife. In the present condition of knowledge relating to the cure of "foul brood," we should strongly advise the entire destruction of a single colony, hives and all, where such is found among a number of healthy colonies, as "prevention is better than cure." While the apiarist is doctoring this one colony others may become diseased.

141. Disinfection of Hives with Bromine.—The Rev. G. W. Banck's method is as follows: Stop up ventilators and all crevices opening to the air with clay. Remove the roof

and place a saucer on the floor-board, into which put about twenty drops of bromine; quickly return the roof and allow the hive to stand for twenty-four hours; repeat this, and then wash the hive with a solution of ½oz. of bromine to a gallon of water.

142. Care to be exercised when using Bromine.—As this is an exceedingly volatile and dangerous drug, great care must be exercised in its use. Keep the bottle stoppered with glass and enclosed in a hermetically-sealed outer case. Do not inhale the fumes, which can be seen distinctly.

XIII.—ENEMIES OF BEES.

LUCKILY for the bee-keeper, the British Islands contain very few bee-enemies, and with few exceptions—which do not come under the usual acceptance of the term enemy—little fear may be entertained of much damage occurring by their depredations. Among those which attack a colony openly, and are usually denominated enemies, various birds are included—these commit the greatest amount of damage; next in importance are wasps, toads, mice, moths, and spiders; but those which, although committing a far greater amount of harm to the colonies, are not usually placed in the category of bee-enemies, are fertile workers and aphides (green or black fly).

143. Birds.—These may be divided into two classes—domesticated and wild. Among domesticated, ducks will be found the most destructive; they seem quite proof against the stings. Frequently have we seen them watching at the entrance of hives, and "gobbling" the bees up almost as fast as they emerged or alighted. Fowls, as well as ducks, will frequently contract the habit of bee-killing; but in both of these cases, as with wild birds, it appears to be individual birds who contract this habit, and so the whole of the members of any species or variety must not be branded as "apicides." The Great Tit *(Parus major)* and the Blue Tit *(Parus cæruleus)* are both addicted to the habit of killing bees, watching at the entrance and snapping up any bee that emerges from it. The Cole Tit *(Parus ater)* will frequently eat dead bees, a few of which are usually found on the ground under the entrance to hives; but we have failed to discover any member of this variety killing bees. Many bee-keepers have supposed that the Swallow *(Hirundo rustica)*, Swift *(Hirundo apus)*, Martin *(Hirundo urbica)*, and Sand Martin *(Hirundo riparia)*, are enemies, but we must differ from such an idea, and glad we are that the character of these beautiful harbingers of spring can be cleared of such a charge. Often have we watched the bees chasing the swallows, and driving them away from the vicinity of the apiary. Especially is this noticeable in early autumn, after the honey flow

has ceased, when the bees' irritability is very much increased. The Red-backed Shrike, or Butcher Bird *(Lanius collurio)*, we have frequently seen catching bees and impaling them upon the barbs of a wire fence surrounding the apiary.

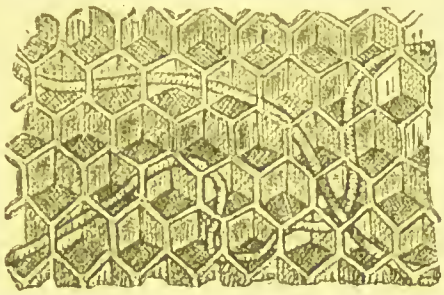
144. Toads.—These should never be allowed in sufficient numbers in an apiary to do any very serious damage. They will watch the entrances of hives and lick up any bee coming within reach of their long tongues; also those bees which have been blown among weeds or grass under the hives.

145. Mice.—These busy little animals will cause much destruction among the hives and bees if not kept within bounds. Wherever their signs are noticed about the hives, search should be made for them, and when found, killed. They will frequently get into the hives among the combs if the entrances are too large; when such is the case, the bees are quickly destroyed, the combs irreparably damaged, and the honey consumed. A good preventive is to place a wire lengthways across the entrance; this will prevent the entrance of the mice, at the same time allowing sufficient space for the exit and ingress of the bees, and ventilation. Under the coverings of straw skeps is a favourite place for mice to make nests, holes being frequently gnawed through the crown, and the combs tainted with their excreta; this latter will frequently cause the bees to vacate a hive.

146. Wasps.—These are very troublesome to the apiarist in autumn and late summer. All entrances to hives should be kept well contracted, as although a colony may be strong enough to defend a wide entrance, the wasps being able to bear a greater amount of cold than bees, will attack a hive and gain an entrance at such times when the temperature is too low to admit of the warmth-loving bees guarding their entrance properly. They will also endeavour to gain an entrance, and are usually successful, before the bees are fairly awake for the day, and also after sundown, while twilight lasts. All wasps seen during March, April, and beginning of May, should be killed, as those found flying then are the queens, who are searching for locations in which to found a new colony; so that killing one of these in spring means many thousands less during autumn. Narrow-mouthed bottles of stale beer hung about the apiary will be the means of trapping large numbers; their nests should be searched for and destroyed at night.

147. Moths.—These are a great nuisance in the store-room, but not so much in the hives, although they are in the first instance usually reared in them. If colonies are kept strong, especially if they are Italians, moths have little chance to do any material damage in the hive; but where combs are stored, they will quickly be spoilt by the moth larvæ drilling tortuous holes along the mid-

rib and through the cells of the comb (see illustration), thus rendering the combs nearly valueless to the bee-keeper. They leave a quantity of dirt and material, something like a spider's web, but woven into the form of a tunnel, through which the larvæ traverses the comb ; this is very difficult of removal. Where any traces of moth are discoverable in combs, they should be exposed to the fumes of burning sulphur. All scraps of wax and other *débris* should be rigorously kept from the store-room or apiary, as this attracts moths and provides lodgings for them. The larvæ whenever seen should be killed ; they will frequently be found on top of the frames and between the folds of the quilts, or anywhere where the bees are unable to dislodge them. They are very like the white maggots found in apples, and move very rapidly when disturbed ; they vary much in size, from $\frac{1}{16}$in. to the full-grown one of $\frac{3}{8}$in.



Ravages of Wax-moth Larvæ through a Comb.

148. Spiders.—These should be kept from spinning their webs near the entrances of hives.

149. Ants.—These are a nuisance, and no doubt consume a small quantity of honey; but they do little injury. A piece of flannel wrapped round each leg or stand of a hive, and occasionally saturated with carbolic acid, will prevent their entrance.

150. Earwigs.—These do no harm to the bees or stores, but they make a nasty mess about the inside of the hives. As they are provided with wings, the bee-keeper is powerless to prevent their entrance. The plan advocated for ants will, however, prevent the entrance of many.

151. Aphides.—We now come to one of those enemies which, though not causing any visible damage to the colony at first sight, do more harm to bees and bee-keeping than all the foregoing massed together. Aphides, by some termed Green or Black Fly and blight, are a considerable source of inconvenience to the gardener, different varieties of the species attacking different plants or trees, in many cases totally destroying them. They are a parasitic insect, and in most cases adhere to the tender shoots of the plant in clusters, sucking the juices and thus destroying the plant. There is a most peculiar arrangement in many species, at the extremity of the body, consisting of two horns ; from these

the aphide exuviates a transparent saccharine fluid, which falls on the leaves and ground surrounding the plant or tree, causing a glistening appearance. This substance has been known for centuries by the name of "honey-dew." Ants, bees, and other sugar-loving insects, eat this substance greedily, the bees storing it in their cells in exactly the same manner as honey. It is the latter proceeding on the part of the bees that causes so much loss to the bee-keeper. If sections are sold containing any of this aphidian excreta, the bee-keeper will assuredly lose his customer, thus damaging his reputation beyond recovery. If the hive is stored for winter with the stuff, the bees suffer, as it is not suitable food for them to winter upon. This latter circumstance is most likely to take place, as it is just after the honey-flow—when the bees' instincts lead them to fill the lower portion of the hive or body-box—that it is most frequently collected, as there is little else for them to obtain. At certain seasons, and in certain districts, a greater number of these insects will be found than at others.* For the purpose of preventing the storing of it in the body-box, it is best to commence rapidly feeding with good sugar syrup directly it is found that the excreta is being stored in any quantity; this is the only defence to be made. Rain is the best preventive, as that washes it from off the leaves. The storing of it in sections can be prevented by removing them from the hive; it is of no use their remaining on, being of no value when filled. The appearance of "honey-dew" is difficult of description. We will take, for example, the case of a section being partially filled with honey, and partially with aphide excreta. Hold it up to the light, and look through; in the centre the cells will be found to have a beautiful golden transparent appearance—that is honey; but surrounding these cells, and in some places becoming intermixed with them, a dark grey, semi-transparent substance is stored, appearing dead and in marked contrast by the side of the honey—this is the excreta. It has no rich colour as honey, but looks as if soot had been sparingly mixed with sugar syrup, although it has no granular appearance. Its taste to most people is extremely nauseous, although we have met exceptional instances where it has been described as passable honey.

152. Fertile Workers.—In a normal condition there is only one bee in the hive that has the power of reproduction—the queen; but when a hive has lost its queen, and is without the means of rearing another, in some cases a worker or certain of the workers usurp the functions of the queen, and commence to lay eggs; as these workers have not and cannot be fertilised by the drone, the eggs laid produce drones; as a consequence the stock, unless provided with a queen, will die out. This condition of

* Honey-dew is also ascribed to a disease of the leaves of the plants on which it is found (See "Dictionary of Gardening," article "Honeydew").

things is very rarely experienced with the English, or black bee, but in foreign varieties it is more general, especially so with Cyprians and Syrians. The means of detecting their presence is easy. Although the hive is queenless, eggs will be found in both worker and drone-cells, but not laid, as with a fertile queen, regularly in one large patch, but scattered about, very rarely more than four cells in close contiguity being used. Even in those cells which are occupied by eggs they are not laid in a uniform manner: here an egg is stuck on the side of the cell, instead of on the bottom; the next cell has four or five—this latter circumstance is frequently observed where a prolific queen is in the hive, and there are not sufficient workers to cover the number of eggs she has the power of laying—the eggs are found in both drone and worker-cells at times when it is not natural for drone eggs to be laid. These eggs, after hatching and being capped over, are in all cases capped as with drone-cells, although they may be laid in worker-cells. The drones thus produced are smaller than the natural ones, no doubt on account of their cramped condition in so small a cradle as a worker-cell. The easiest way of getting rid of these pests is to unite the colony to a strong stock having a fertile queen; after a few days it can be divided, and a fertile queen given, or a queen-cell, or brood and eggs; but in all cases this latter should be provided. Caging a fertile queen in the hive for two days will usually cause the destruction of fertile workers. Again, we must quote the adage, "prevention is better than cure." Never allow a colony to become queenless without a means of rearing another queen, in which case fertile workers will be unknown.

153. Finale.—All the foregoing instructions have been tested by the writer himself, and have been found the most easy and successful. One might almost wish that the skill required might be imparted to others by writings, yet we know it cannot be; but much time, trouble, and expense may be saved by listening to the teachings of others, or by reading their writings. "Example is better than precept," but where both precept and example can be obtained, success by following both must be assured. It is this that has made the writer call attention to the good that may be gained by taking a course of instruction from some apiarist of note. By watching his movements, that delicacy of handling, in which so many are deficient, may easily be obtained, and bee-keeping become a pleasure rather than a fear.

Each of us thinks his hobby the best. If the writer, in the foregoing pages, has allowed any such ideas to be advanced, he apologises. "The astronomer who can unravel the mechanism of the heavens—the chemist who can trace the atomic processes of matter upon earth—or the metaphysician who

can assign the laws of human thought—or the grammarian who can discriminate the niceties of language—or the naturalist who can classify the flowers, and the birds, and the shells, and the minerals, and the insects which so teem and multiply in this world of wonders; each of these respective inquirers is apt to become the worshipper of his own theme, and to look with a sort of indifference, bordering on contempt, towards what he imagines the far less interesting track of his fellow-labourers. Now, each is right in the admiration he renders to the grace and grandeur of that field which he has explored; but all are wrong in the distaste they feel, or, rather, in the disregard they cast, on the other fields which they have never entered. We should take the testimony of each to the worth of that which he does know; and then the unavoidable inference is, that that must be indeed a replete and gorgeous universe in which we dwell, and still more glorious the Eternal Mind from whose conception it arose, and whose prolific fiat gave birth to it, in all its vastness and variety."

The Writer has only to add, that if any of his readers are ever in any difficulty with their bees, and will send full particulars to the Editor of *The Bazaar*, 170, Strand, London, the best and fullest advice the Writer can give will be freely placed at their service.

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